DECEMBER, 1961

Plant Engineering®

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The magazine that helps plant engineers with their everyday problems

Vol. 15, No. 12 Circulation of this issue 52,270

Better than Manual Control for So Many Reasons!

NEW LOW COST EC&M MAGNETIC CONTROL FOR DC CRANES

Now, on any DC application up to 55 HP, 230 volts, you can have the advantage of full *magnetic* control where manual control formerly was specified purely on the basis of price. At comparable cost, EC&M's new *Type PT* Magnetic Control gives you—

Compactness—fits easily in crane cabs, on crane walkways and wherever space is limited.

3-point or 4-point Speed Control

Reduced Motor Wear through automatic acceleration. Acceleration relays adjustable from a minimum of 0.2 second up, per step.

Space Saving—front connection permits mounting against wall.

Hi-Speed Lowering with 4-point hoist control.

Fewer Spares—no manual control parts to stock.

Choice of Mounting Arrangements—MA Master Switch can be ganged with other masters or self-contained on top of the PT Controller.

Standardized Overload Protection is available. Separate panel for protection of 1 to 4 motors is smaller, simpler than protective panels used with manual controllers.

Write FOR BULLETIN 6131

"PT" CONTROLLER
with front cover removed

Available for Hoist, Bridge and Trolley motions on cab or floor-operated cranes

SQUARE D COMPANY

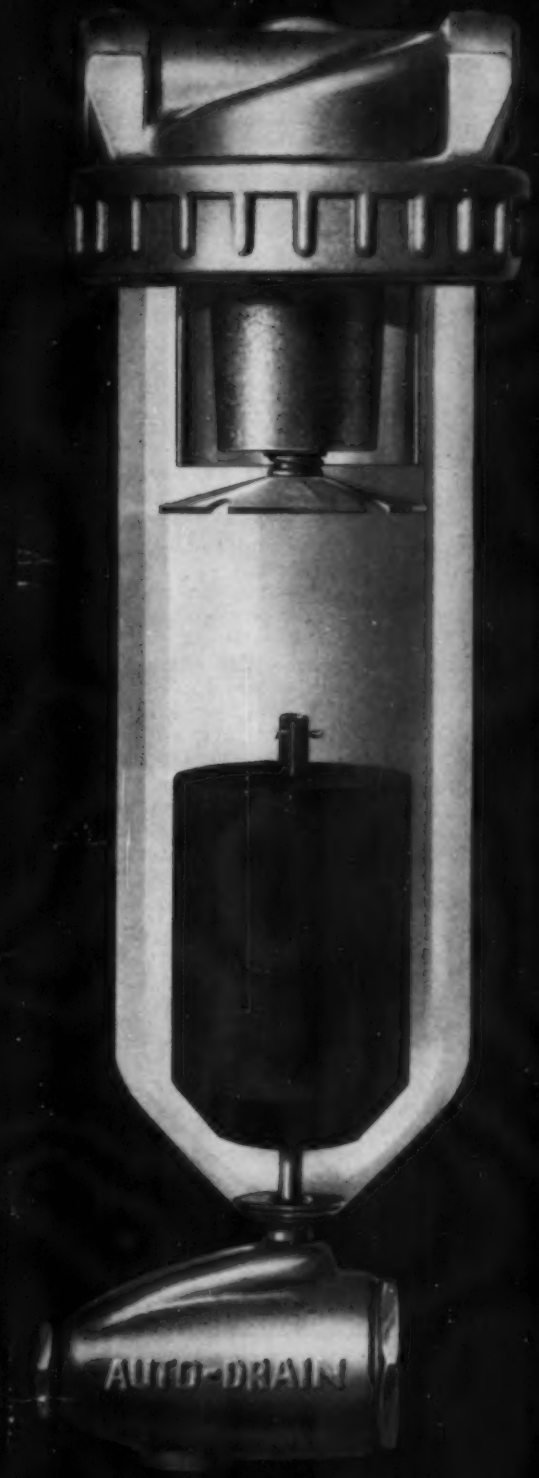
EC&M DIVISION • CLEVELAND 28, OHIO

wherever electricity is distributed and controlled

7418

Circle 501 on postcard, page 33

NOW....even more efficient!



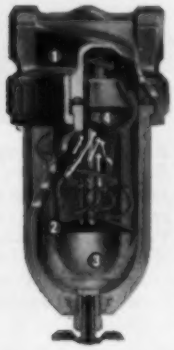
SERIES D602, D603
Watts "TORNADO ACTION" filter with new Automatic Drain

Designers — and users — of air-operated tools and equipment specify Watts filters because their superior filtering action and moisture-removing qualities have proved their efficiency. Now, with Watts' new automatic drain, you can have *truly automatic* filtering, too.

Watts "HIGH EFFICIENCY" filters remove condensate from air lines so effectively that draining of the bowl, in some instances, becomes necessary as many as three times daily. To meet the demand for labor-saving components, Watts has designed the "Auto Drain", a completely automatic drain filter which incorporates all the features found in the standard Series 602, 603 filters.

By use of the pilot principle, efficient and dependable removal of foreign particles and liquid condensate is attained. When liquid rises, the float admits air to the pilot valve chamber, opening a scavenger valve and allowing the trapped liquid and impurities to be blown out the drain opening.

Available in full range of sizes; ¼" through 1". Transparent bowls for pressures up to 150 PSI; metal bowls for pressures to 250 PSI.



How Watts "Tornado Action" removes condensate and dirt from air lines

Curved inlet ❶ directs incoming air in downward helical pattern. Larger impurities and condensate are "thrown out" by centrifugal action, collecting on bowl sides and spiraling downward past baffle ❷ into quiet chamber for draining-off. Baffle traps sediment in quiet chamber ❸ and allows only dry air centrifugally cleaned of larger impurities to reach filter element ❹ where finer particles are filtered out.

WATTS

FILTERS • REGULATORS • LUBRICATORS

YOUR SAFE SPECIFICATION

WATTS REGULATOR COMPANY, 14 Embankment Road, Lawrence, Mass.

Write for free technical catalog:
Circle 502 on postcard, page 33

Charts, diagrams, and performance data enable you to specify the correct Watts pneumatic equipment

Plant Engineering December 1961, Volume 15, No. 12

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Editorial Director

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'ROUND ABOUT with the editors

Edited by R. L. Marinello

Season's Greetings to All Our Readers from The Editors of Plant Engineering

Booth 240—Come Up and See Us

PLANT ENGINEERING editors will be out in force at Booth 240 of the Plant Engineering and Maintenance Show, Convention Hall, Philadelphia, from January 22 through 25.

We hope that many of our readers will stop in and visit with us. This is our yearly get-together and we would like to meet and greet you.

So, don't forget—two-four-zero—right by the entrance. We'll be looking for you.

All Engineers Dinner

AS IN THE past, the American Institute of Plant Engineers is planning an All Engineers Dinner on Tuesday, January 23, in Philadelphia during the Plant Engineering and Maintenance Show and Conference. The dinner will take place at the Warwick Hotel, reception at 6 p.m. and dinner at 7 p.m.

The dinner speaker will be Virgil Couch, Director of the Industry Office of the Office of Civil and Defense Mobilization. Mr. Couch will talk about the plant engineer and his role in civil defense.

Plant engineers planning to attend the show and conference can make their reservations or purchase their dinner ticket by writing to Walter Knapp, c/o Valley Forge Brewing Company, 151 W. Marshal St., Norristown, Pa. Dinner tickets will be $8.50 per person; if purchased in advance, the price is $8.00.

Kempf Elected Director of IES

Richard M. Smart, left, Sylvania Electric Products and Regional Vice President of IES and James R. Chambers, Appleton Electric Company, President of IES, congratulate Vern Kempf, our Electrical Editor, on his recent election as a Director of the Illuminating Engineering Society.

Ventilation Conferences

DATES FOR THE 11th Annual Industrial Ventilation Conference are February 19 through the 22nd. As in the past, it will be held at Kellogg Center, Michigan State University, East Lansing, Michigan.

Conference program will consist of a combination of lectures and classroom sessions on hood design, dust collectors, makeup air, fan applications and general airflow principles.

Readers interested in more information about this conference should address their inquiry to 11th Annual Industrial Ventilation Conference, Continuing Education Service, Michigan State University, East Lansing, Michigan.

A similar workshop-lecture Industrial Ventilation Conference is being planned at the North Carolina State College on March 19 through the 22nd. For further information on this conference, write to M. V. Griffith, Jr., College Extension Division, North Carolina State College, Raleigh, North Carolina.

Removing Oil and Water in Electronic Equipment

TWO FORMULATIONS have been developed by the Navy for the displacement of fuel oil and for the removal of water from electrical, electronic or mechanical equipment.

The fuel-oil-cleaning emulsion retards rusting of the ferrous metals with which it comes in contact, while the water-displacing composition leaves a persistent and effective rust inhibiting

Subscriptions: U.S.A. $10. Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by the 15th of month to make the change effective with following month's issue. Controlled circulation publication, postage paid at Milwaukee, Wis. Published monthly.

BPA NEP

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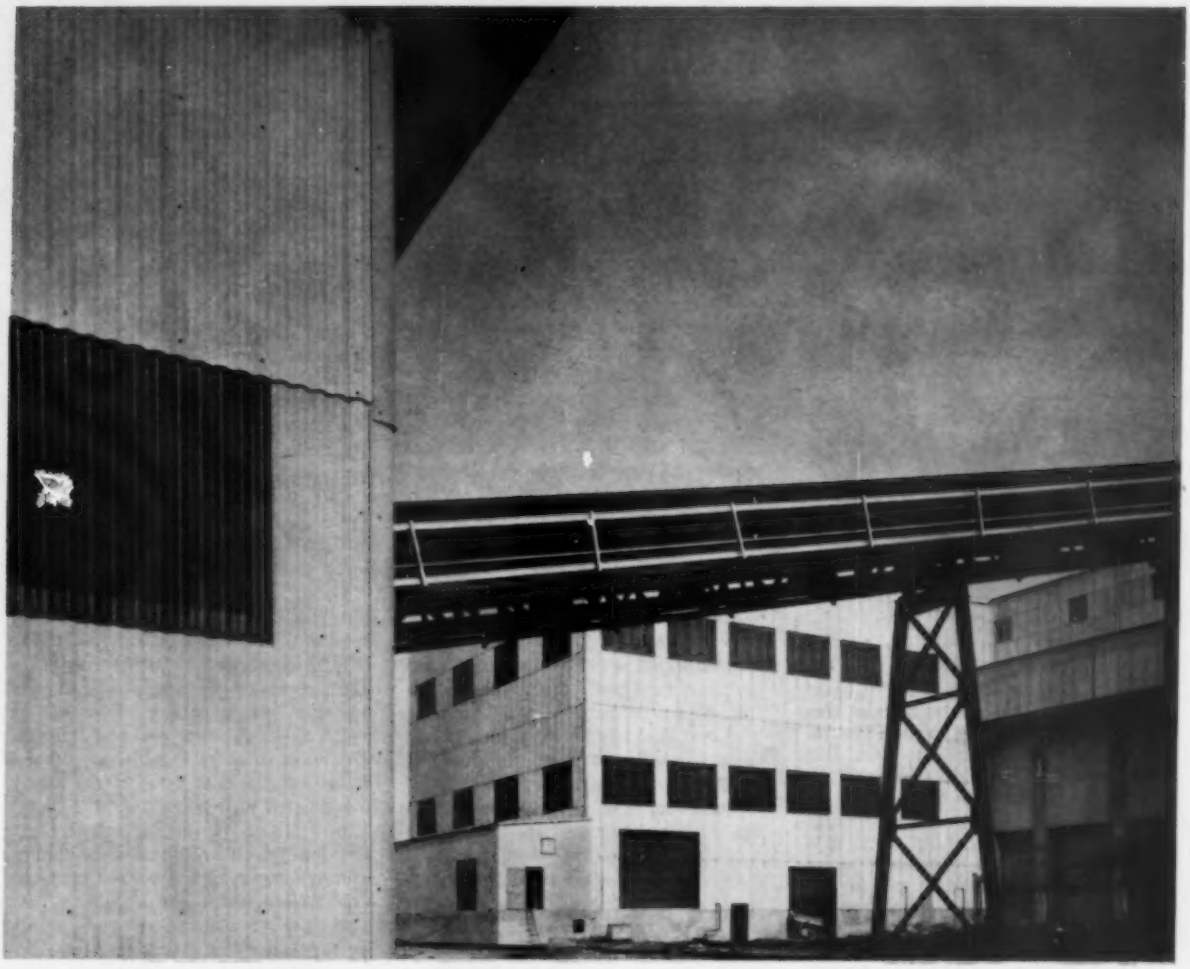


Better light at lower cost because **J-M CORRULUX®** *provides*

SHATTERPROOF DAYLIGHTING

J-M CORRULUX IS an economically-priced, translucent building panel manufactured by Johns-Manville. It is made of weather-resistant, light-stabilized resins reinforced with high strength Johns-Manville fiber glass. Corrulux panels are noted for their shatterproof strength, resistance to industrial fumes, easy installation, long life and exceptional light admission.

J-M CORRULUX HELPS INCREASE EFFICIENCY. Although Corrulux admits up to 80% of the light striking it, the light is diffused. There is no glare to cause worker eyestrain. Transmission of sun heat is also reduced—a boon on hot summer days. A soft green color was chosen for the plant above. But there are 17 other colors, with varying light transmission qualities, for you to choose from.

J-M CORRULUX WORKS EASILY, CUTS COSTS. Exterior framing can be eliminated (see panel at left of photograph) because Corrulux panels handle as easily as the panels of J-M Corrugated Transite® which are used for the exterior walls of this plant. And when framing *is* required, Corrulux reduces it to a low-cost minimum. Corrulux can be sawed and drilled . . . bolted or nailed. Corrulux is also available in flat panes, which end window breakage problems forever when glass panes are replaced with shatterproof Corrulux Flat Panes.

WHERE YOU CAN GET CORRULUX. Three weights of Corrulux are available: Functional, Structural and Heavy Structural. For more details, look in the Yellow Pages under *Plastics*, or write to Johns-Manville, Box 158, Dept. PE-12, New York 16, N. Y. In Canada, address Plastics and Allied Products, Ltd., Dundas, Ont.

JOHNS-MANVILLE JM PRODUCTS

Circle 503 on postcard, page 33

How much will a 50% cut in bulk handling costs add to your profits ?

Probably a lot, if your plant is at all like the thousands now using Roura Hoppers. With a Roura self-dumping hopper on your lift truck one man can do the work of two . . . and use less time doing it.

Roura Hoppers attach in seconds to any lift truck (fork or platform). They can't slip off. Operator picks up loaded hopper, transports it, releases the latch—and the hopper *automatically* dumps itself, rights itself, locks itself. The *Roura Way* adds to your profits because it's the fastest, lowest cost method of handling bulk materials and small parts —hot or cold, wet or dry.

SPECIFICATIONS: Eight sizes, ⅓ to 4-yard capacities. Construction: 3/16" steel plate with continuous arc-welded seams. Heavier plate, stainless, aluminum, galvanized available. Mounted on live skids or choice of wheels. Standard models shipped from stock.

DUMPS ITSELF RIGHTS ITSELF LOCKS ITSELF

ROURA
Self-Dumping
HOPPER

WANT MORE DETAILS? Just clip this coupon to your letterhead and mail to

ROURA IRON WORKS, INC.
1413 Woodland Ave., Detroit 11, Michigan

Circle 504 on postcard, page 33

'ROUND ABOUT

film over the surfaces of the equipment. Both formulations are relatively harmless to most electrical and electronic insulation.

Also given are step-by-step procedures for salvaging equipment that has been submerged in fuel-oil-contaminated water and a method for sealing the insulated parts of electromotive equipment against the penetration of flooding water.

For the complete 24-page report, identified as PB 171 479, send your request to Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. Price of the booklet is 75 cents.

Maintenance Weldors' Clubs

WELDORS CAN BE of assistance to other men doing the same kind of work and, in turn, benefit themselves by taking an active part in the newly organized Maintenance Weldors' Clubs. Membership is open to practical weldors, particularly those in the maintenance field, where additional and specialized needs can be satisfied through activities discussing new techniques and materials, on-the spot demonstrations, and audience participation through try-it-yourself facilities.

The Club's charter is "dedicated to the advancement of welding knowledge, skill and good practice." It aims to (1) assist weldors in organizing regional club meetings; (2) provide practical welding educational training and demonstration activities; and (3) promulgate the advantages of maintenance and repair welding to industry.

Information concerning membership and regional club organization can be obtained from J. G. Magrath, President, Eutectic Maintenance Weldors' Club, Eutectic Welding Alloys Corporation, 40-40 172nd St., Flushing 58, New York and 5051 Cote de Lisse Road, Montreal 9, P.Q., Canada.

Safety Booklets

KNOWING THAT one set of rules on safety may not apply to all possible operations or sections in an industrial plant, Maytag went one step further by preparing special booklets for each department. The company's safety department has prepared 20 safety booklets to cover such operations as: wire harness, plating, paint department, automatic assembly, machining, powdered metal, and many others.

There is one which many plant engineering departments will be interested in—the booklet on safety rules for Maintenance. It lists such safety practices as tagging out controls of any machine being repaired, proper use of ladders, need of a welding permit, grounding of portable tools, and others. In all, there is a total of 56 safety items listed in this booklet.

In addition to the individual plant area booklets, the company also supplies each employee with a booklet on General Safety Rules and Policies. This booklet first discusses general safety precautions, then lists specific rules pertaining to clothing, eye protection, electrical equipment, machinery, tools and materials, and housekeeping.

Readers who would like to know more about this booklet or any of the others should write to The Maytag Company, Newton, Iowa.

Plant Engineering Editors Meet President Kennedy

Two of Plant Engineering's editors took part in a conference arranged by the Society of Business Magazine Editors with President Kennedy in the Cabinet Room at the White House on September 20. Dick Morris, Editorial Director, is behind the President's right shoulder. Tom Hanson, Editor, has only himself to blame for being obscured by man at the President's left.

CLIMAX MOLYBDENUM

Molysulfide® News Digest

CLIMAX MOLYBDENUM COMPANY, a division of American Metal Climax, Inc., 1270 Avenue of the Americas, New York 20, N.Y.

EDITORIAL PAGES OF LEADING TRADE MAGAZINES FEATURE MoS_2 INFORMATION

Higher temperatures, lower temperatures, greater pressures, longer lubrication life, all have combined to focus more attention on the uncommon lubricating values of molybdenum disulphide.

That's why editors are devoting more and more space to descriptions of what MoS_2 can and cannot do.

One article tells how MoS_2 prevents harmful friction in brake linings. Another discusses its use as a compressor lube substitute. Still another reports on tests of epoxy-resin compositions containing high concentrations of MoS_2 for industrial use on bearings, seals and friction strips.

Press fittings, wire drawing, cutting tools, ball joints—there are MoS_2 stories about these uses, too.

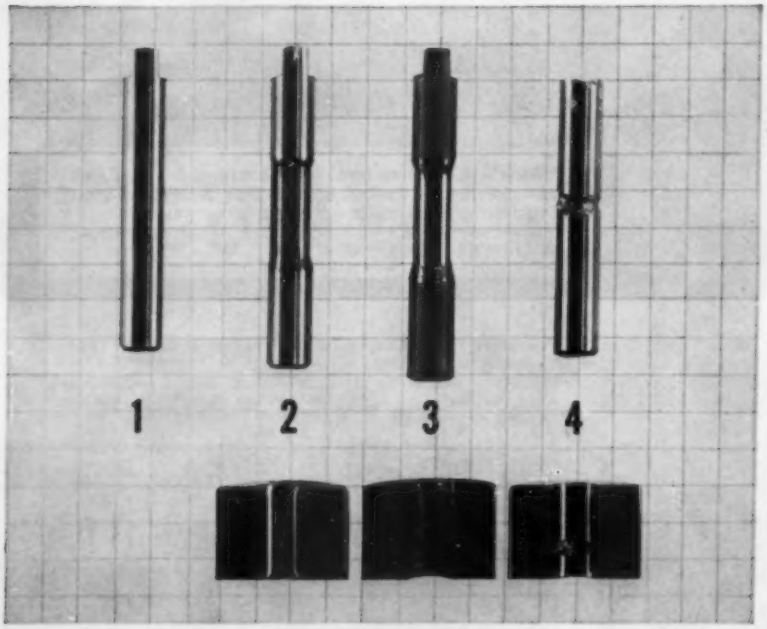
MoS_2 as a solid-film dry lubricant has been the subject of several articles. One details high-temperature properties; another describes a new bearing design that can increase bearing life as much as 450%.

Write us for a complete bibliography of published material on molybdenum disulphide.

P.S. Climax publishes a newsletter that describes even more uses. Let us know if you'd like your name on the mailing list.

Circle 505 on postcard, page 33

Proof of MoS_2's High-Pressure Properties



Photograph above shows mild steel test pins. No. 1: Unused pin, No. 2 (lubricated with mineral oil and Molysulfide) and No. 3 (with Molysulfide bonded coating) were subjected to rotating pressures between bearing halves. Both were elongated and extruded without galling, seizing, or weight loss. No. 4 shows typical failure with conventional lubricant. Note that the key sheared off and pin and block were galled and seized.

Circle 506 on postcard, page 33

ASME SHOW DEVOTES SESSION TO "MOLY" LUBES

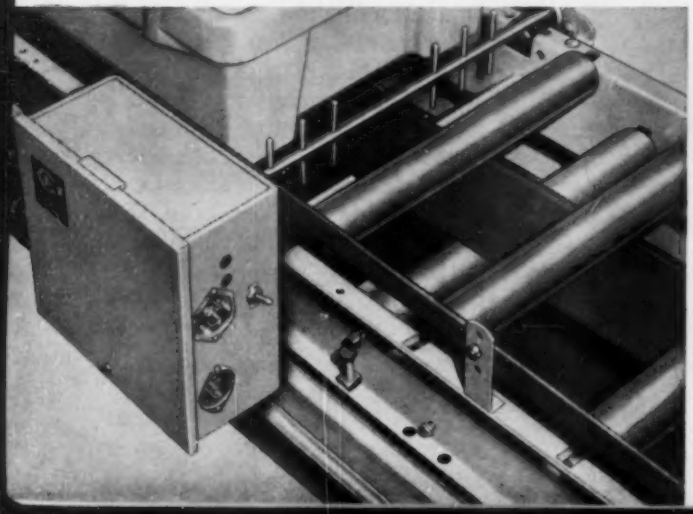
New evidence of mounting interest in molybdenum disulphide was shown recently among members of the American Society of Mechanical Engineers. A spokesman for the Climax Chemical Division was invited to speak on "Molybdenum Disulphide as a Lubricant" before the Machine Design Division at the 1961 Design Engineering Conference. A copy of this 24-page paper is available on request.

At the same meeting, engineers from Socony Mobil Oil Company spoke on "Molybdenum Disulphide as an Additive to Improve the Performance of an Automotive Multi-purpose Grease." Write to Climax for a copy of this paper.

Circle 507 on postcard, page 33

"Skate wheel" diverters increase rate of flow and eliminate mechanical damage often caused by swinging metal arm diverters. Controller—designed with mechanical spring linkage to eliminate solenoid burnouts—may be mounted to either side of conveyor.

"Paddle wheel" tray stop eliminates pneumatic system and can be used as a spacer, counter or with a timer to release trays at programmed intervals. Paddle, spring-held to bottom of each passing tray, is operated by force of the moving tray.



Proximity type sensing heads, transistorized and plug-in, will read without failure at $\frac{5}{8}$" to improve flow reliability. Passing reader cards disturb a field emitted by sensing head and produce output signals to control conveyor operation.

CONTROL

What's new in material handling control?

Make your conveyor system more efficient with these new diverters, proximity readers, stop-spacers.

These new Cutler-Hammer specialized components have been successfully applied in some of the most outstanding automated material handling systems in operation.

The "roller skate wheel" diverter, for example, can double conveyor capacity without increasing conveyor speed. By eliminating the space formerly required for swinging metal diverter arms, carrying capacity is increased . . . damage to tote pans from swinging diverters is eliminated.

Adding greatly increased flexibility, these new devices have proven their efficiency in the most demanding engineered systems. Now they're being made available to you for your special applications. Each of these components measures up to the same high quality standards you've gotten for so long from Cutler-Hammer limit switches, pushbuttons, motor starters and other control apparatus used on conveyor systems.

WHAT ELSE IS NEW AT CUTLER-HAMMER?

These new conveyor control devices are typical of the many improvements coming out of Cutler-Hammer's systems engineering experience. As new problems are tackled, new ideas for solutions mean more and more improved new products are developed. Why don't you call your Cutler-Hammer sales office soon for new ideas that can help you solve your material handling problems?

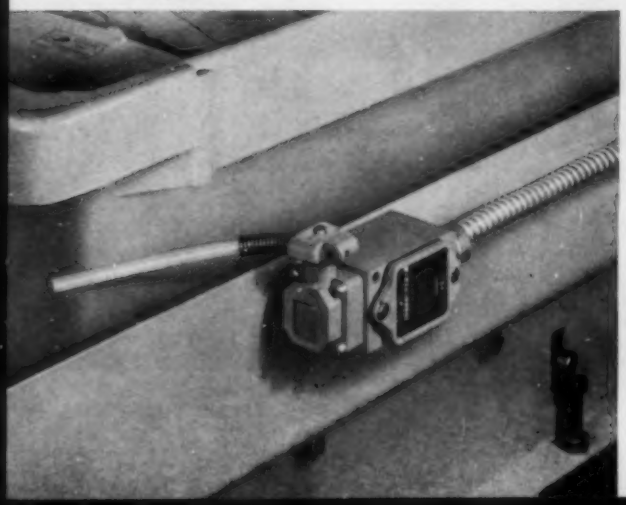
WHAT'S NEW? ASK . . .

CUTLER-HAMMER

CONTROL

Cutler-Hammer Inc., Milwaukee, Wisconsin • Division: Airborne Instruments Laboratory • Subsidiary: Cutler-Hammer International, C. A. • Associates: Cutler-Hammer Canada, Ltd.; Cutler-Hammer Mexicana, S. A.

Limit switches. Many operator options to fit your particular need. New spring mounted nylon operator can be mounted on side of conveyor and is actuated by passing trays. Special design is tamper proof and eliminates multiple counts.



Graphic control consoles can be engineered to fit your application. This one is main console for a 6,000 ft. order-picking system. Anodized aluminum conveyor layout has control switches mounted to facilitate manual or semi-automatic operation.

Building new...modernizing

Nothing equals the versatility, quality and economy of Mineral Insulated Cable for jobs up to 600 volts! ☐ It's fast—MI Cable is rigid, yet so flexible electricians make even complex bends by hand, right on the job. ☐ It saves money: since MI Cable takes fewer man-hours to run—you get a better job quicker, at lower cost. ☐ It's safe—MI Cable is solid, ending problem of moisture, heat and

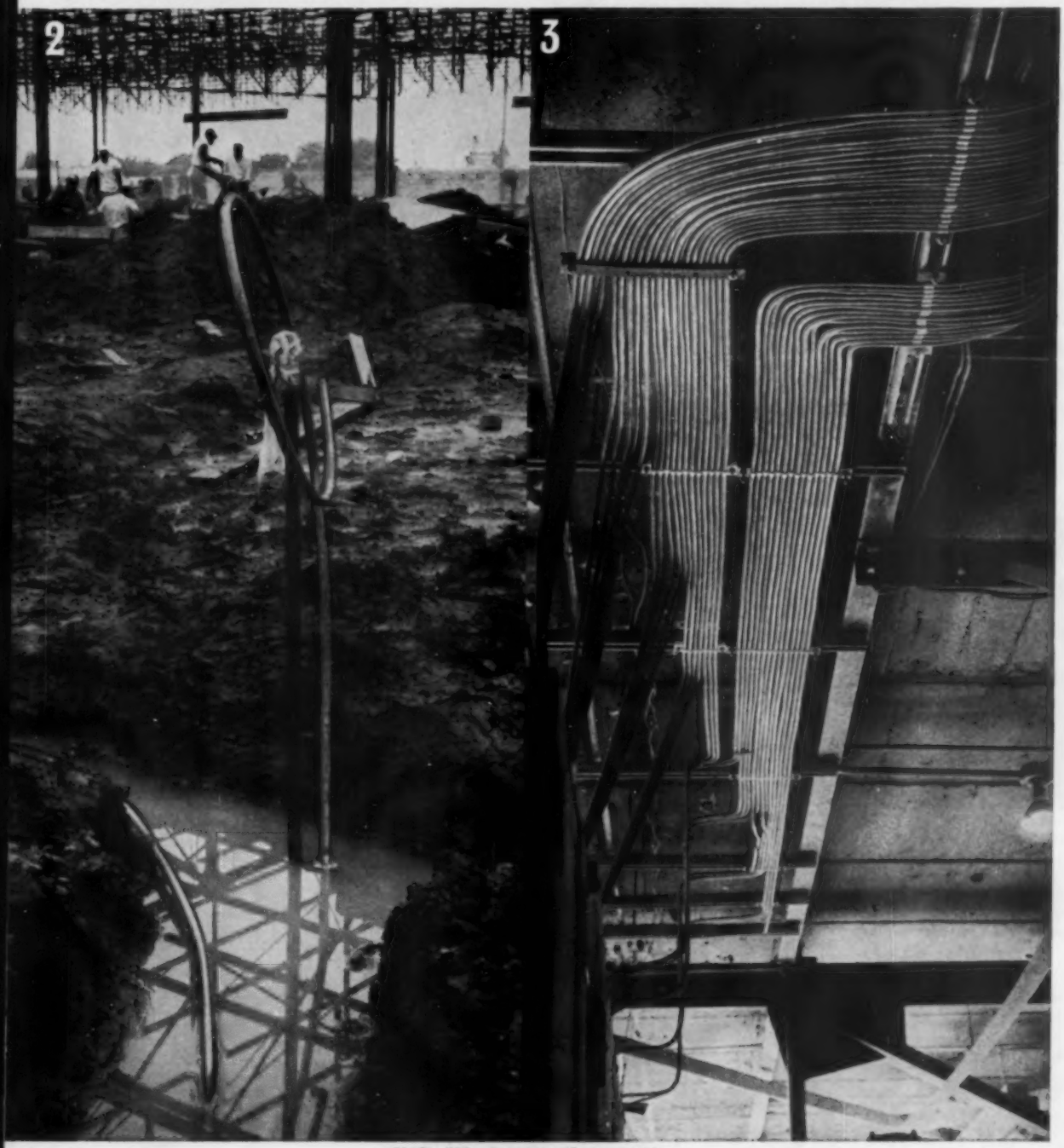
← Circle 508 on postcard, page 33

–good jobs call for MI Cable

explosion. ☐ Get the full details on MI Cable. Write for Catalog S-2. General Cable Corporation, 730 Third Avenue, New York 17, N.Y.

1 Your truck is a complete convenient shop for wiring any job with MI. 2 Only MI Cable could still be in perfect shape—without special protection—after weeks of rain that stopped all other work. 3 Compact—that's MI Cable. Here, 36 separate lines leave a motor control center in rewiring a paperboard plant.

GCC GENERAL CABLE CORPORATION



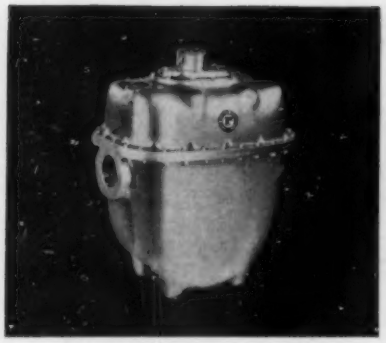
Circle 509 on postcard, page 33

What is your cost-cutting I.Q.?

Do you know these nine products commonly used in industry to cut costs and increase manufacturing profits? They provide the records and controls you need to prevent waste, to improve your end products or to do both.

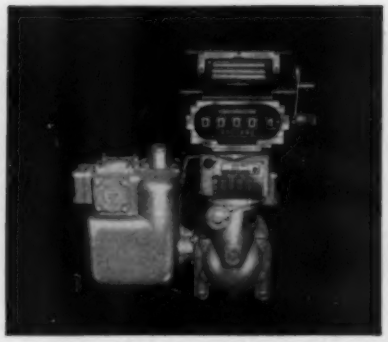
Rockwell as the world's largest single manufacturer of meters, regulators and valves has a world of experience upon which you can call. Wherever liquids, gas or air flow through pipes in your plant our experience can help you save money.

It costs nothing to get the facts—simply send the coupon.



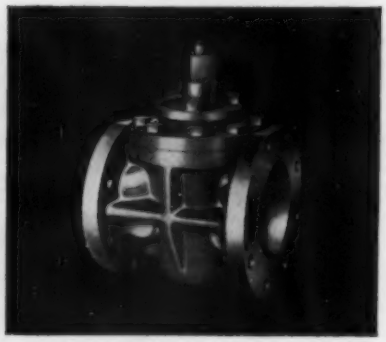
THIS IS A ROCKWELL
LARGE CAPACITY GAS METER

You can use these meters with profit to spot furnace inefficiencies and prevent fuel from being wasted. Your accountants will welcome the cost records these meters provide for their in-plant controls.



THIS IS A ROCKWELL LIQUID METER
WITH AUTOMATIC SHUT-OFF

This meter-control system will save money for you who batch or blend liquids. It will precisely control your formulas, prevent contamination and can be preset to shut-off automatically.



THIS IS A ROCKWELL
PERMATURN® VALVE

This new valve line can reduce costs in your plant. Permaturn valves offer long, trouble-free life in *all* services, easy or tough. They open or shut with a quick quarter turn of a wrench.

ROCKWELL

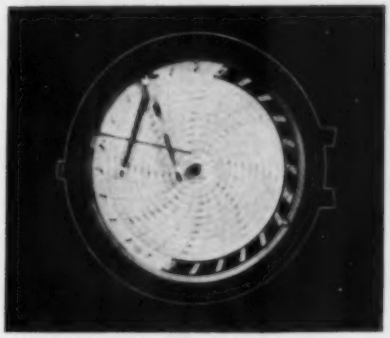
The leading single source for Measurement / Control products and ideas

SEND THE COUPON NOW!

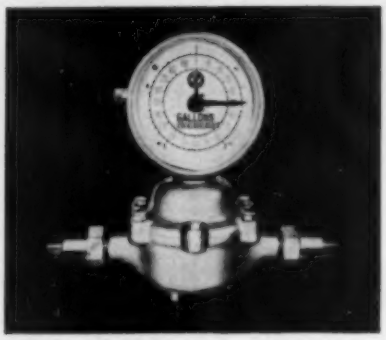
Circle 510 on postcard, page 33

THIS IS A ROCKWELL
CONSUMPTION TEST GAS METER
If you make gas appliances, this meter will save you time and money in adjusting burners to the most economical and efficient flow rate. You can also use it in your laboratory.

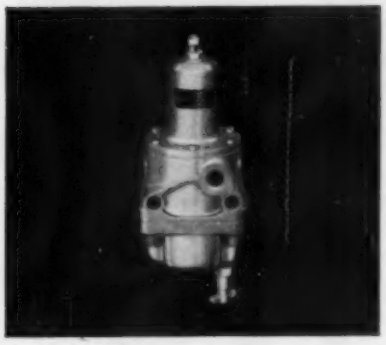
THIS IS A ROCKWELL
GAS PRESSURE REGULATOR
With this regulator you'll save fuel and improve the quality of products fired in furnaces and kilns. It maintains burner pressures at a uniform level, prevents erratic flaming.



THIS IS A ROCKWELL
"SERIES 205" RECORDER
This clock driven gauge provides chart records of pressure, temperature or both. It's available with single or double pens. You can use it profitably to spot inefficiencies or for process control.



THIS IS A ROCKWELL
LOW COST LIQUID METER
This all-bronze meter will measure 207 different liquids. It costs very little, will handle up to 95% of all your in-plant meter needs. With it you'll save by gaining accurate records of piped liquids.



THIS IS A ROCKWELL
COMBINATION FILTER-REGULATOR
This product assures a clean supply of air or gas delivered at a constant pressure to pneumatic systems, instruments, paint spray units, air chucks, etc. You'll save on first cost and through it ease of maintenance.

THIS IS A ROCKWELL MULTIPORT
PERMATURN VALVE (3-way or 4-way)
Multiport valves offer you marked savings on many installations. One 3-way or 4-way multiport can frequently be used in place of two, three or four straightway valves and also eliminate other fittings such as tees and elbows.

INTERESTED
IN
HOW MUCH
YOU CAN
SAVE?

There is hardly a plant of any kind — including yours — where the right application of the right measurement and control methods and equipment won't produce substantial savings. It will cost you nothing to find out. Just talk to an experienced Rockwell field engineer. Let him explore new approaches to cost cutting through measurement and control. There's no obligation and perhaps a lot to gain. Just mail the coupon. Rockwell Manufacturing Company, Dept. MC2M, Pittsburgh 8, Pa. In Canada, Rockwell Manufacturing Company of Canada Ltd., Box 420, Guelph, Ontario.

MEASUREMENT AND CONTROL DEVICES
fine products by
ROCKWELL

Rockwell Manufacturing Company
Dept. MC2M, Pittsburgh 8, Pa.

- ☐ Please have your field engineer call.

Send literature as checked:

- ☐ Valving gas, liquids and slurries, Bulletin V-612
- ☐ Recording pressures, temperatures, Bulletin 17
- ☐ Regulating gas/air pressures, Bulletins 1044, 1059, 1082, 1086
- ☐ Metering liquids, Bulletins P-100, PI-666, OG-400
- ☐ Condensed catalog of all products, Bulletin C-5000

Name_____ Title_____

Company_____

Street_____

City_____ Zone_____ State_____

At Denison — $30,343.50

This is the part:

VANE TYPE HYDRAULIC PUMP ROTOR machined from a 4150 steel forging. Operation: Broaching splines and vane slots. Tolerances: .001" before grinding.

Denison Engineering Division, American Brake Shoe Company, makes a broad line of precision hydraulic presses, pumps and controls. Cost of tool change down time on three vertical broaches was high. Denison turned to Mobil for help.

Mobil recommended use of its new Mobilmet 27 cutting oil. Down time was reduced over 30% . . . 44.5% fewer tool grinds were needed . . . with five-figure savings any plant would welcome.

Mobilmet 27 is a unique cutting oil. Its pressure-temperature-selective additive composition was developed and patented by Mobil. We know that even in a single cutting operation, pressures, temperatures and other conditions can vary widely. Mobilmet oils have an inbuilt ability to adapt to these variables. They have given a new and really broad meaning to the words multi-range, multi-metal, etc.

Mobilmet 27 keeps tools sharp far longer, with substantial savings. Hard, brittle and draggy metals of many kinds are machined to close tolerances, often with no subsequent finishing operation. Speeds and feeds can often be increased with fewer tool grinds. Staining problems are minimized.

Vernon Smith, Assistant Plant Engineer (at right), and Mobil Representative H. M. Lamb inspect vane pump rotor at Denison's Delaware, Ohio plant.

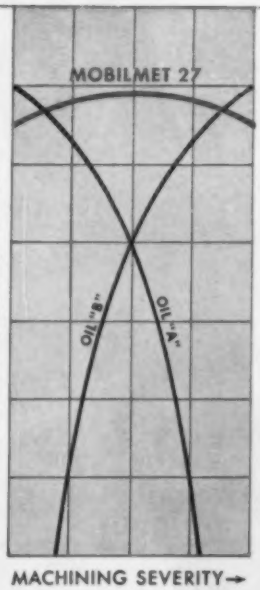
Look into these remarkable Mobilmet oils. You can get details quickly from your Mobil Representative or by writing to: Mobil Oil Company, 150 East 42nd Street, New York 17, New York.

saved with Mobil® help

$24,606 saved in production time. Yearly tool change down time on Denison's three broaches was 1,333.2 hrs., valued at $40 an hour—$53,328 yearly. Using Mobilmet 27 this cost was cut to $36,924, saving $16,404 annually—$24,606 for the 18-month period of use.

$5,737.50 saved in tool grinding. Broach strings formerly required 165 tool grinds yearly for the three machines. With Mobilmet 27, only 114 tool grinds were needed yearly. Thus, Denison saves 51 tool grinds yearly at $75 each—$3,825 a year, $5,737.50 for 18 months.

When the right cutting oil can save $30,343.50, finding that oil is mighty important. Denison found this oil in Mobilmet 27 for broaching slots to .001" tolerances in vane pump rotors that deliver up to 2,000 psi.



MOBILMET 27 with pressure-temperature-selective additive action guards tools . . . speeds work . . . improves finishes.

Mobilmet 27 has a unique ability to handle many metals—many machining conditions, as symbolized here. Red line indicates how Mobilmet 27's tool and finish protective action bridges *both* the conditions met by single-purpose, low-activity oil (A), single-purpose, high-activity oil (B), *and all conditions between.*

The reason: a revolutionary patented additive composition that is pressure-temperature-selective in its action. On tough, draggy steels, Mobilmet 27 has high additive activity, *controlling* built-up edge . . . permits high cutting speeds, assures superior finish and minimum tool wear. And on hard but clean-cutting metals, Mobilmet 27 has low additive activity, *permitting* formation of a proper protective built-up edge . . . allows high cutting speeds, minimizes wear on lip and cutting edge of tool.

One oil replaces many . . . tools stay sharp . . . tool grinds are fewer . . . output is increased . . . tolerances and finishes are improved . . . unit costs are reduced.

Mobil

MOBIL OIL COMPANY
150 East 42nd Street
New York 17, N.Y.

Circle 511 on postcard, page 33

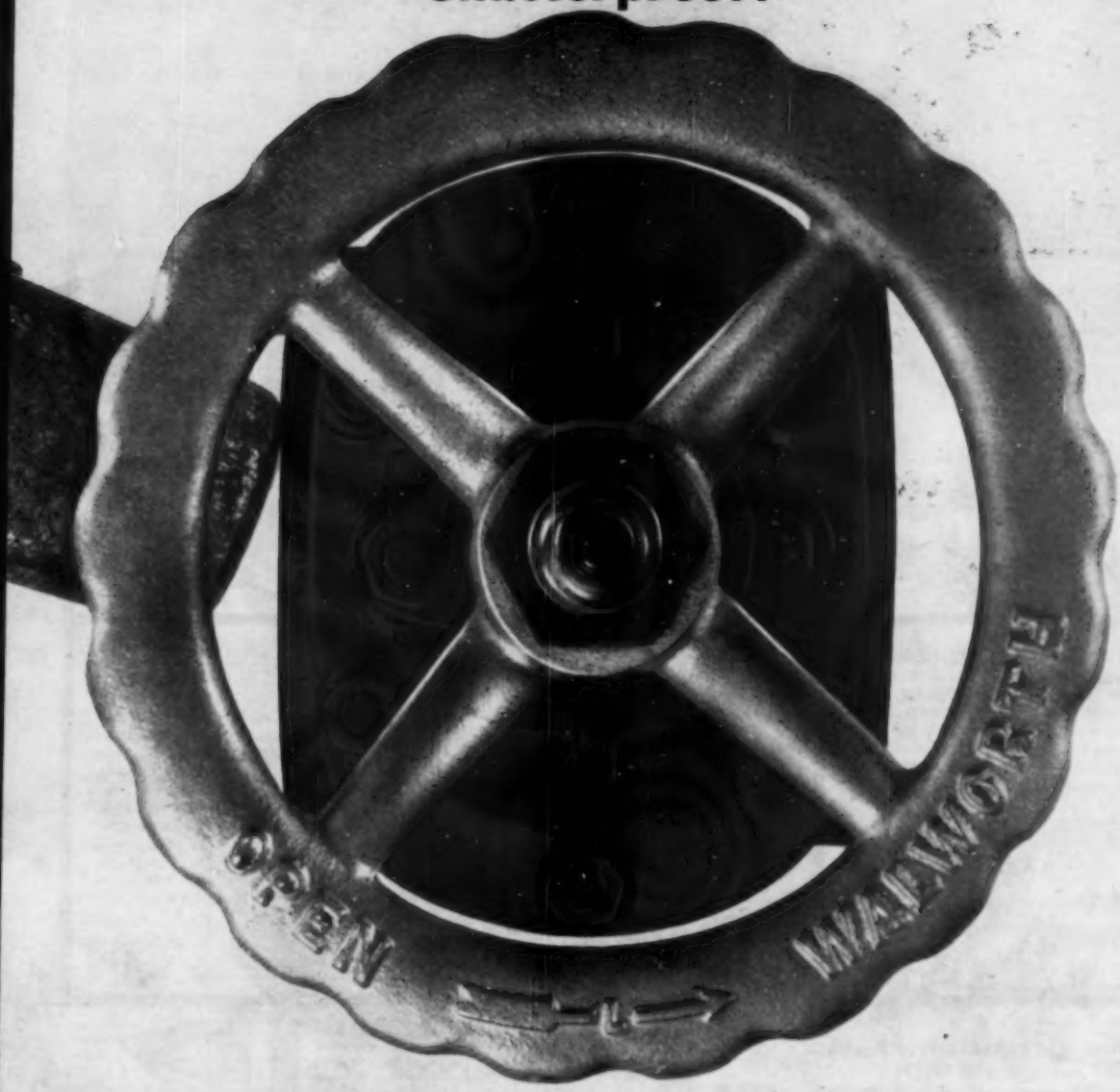
–that's **WALWORTH DUCTILE IRON VALVES!** Walworth's special* ductile iron alloy offers steel-like strength and toughness. That's why these valves are practically "shatterproof"–with exclusive Walworth Valve quality for good measure! ■ Think of **WALWORTH DUCTILE IRON VALVES** wherever your valves face unusual flexing conditions – and where economy is a consideration.

WALWORTH DUCTILE IRON VALVES are now available in gate, globe, check and angle types...2"-24"...in ASA 150 and 300 lb. classes. See your Walworth distributor, or write Walworth Company, 750 Third Ave., New York 17, N.Y.

WALWORTH

the Walworth companies: Alloy Steel Products Co. • Conoflow Corp. • Grove Valve & Regulator Co. • M&H Valve and Fittings Co.

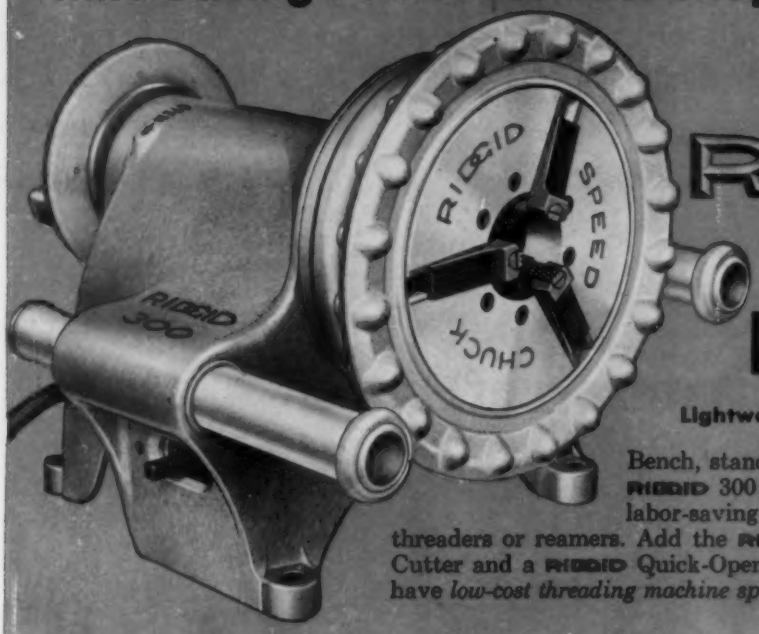
Shatterproof!



*Walworth specifies minimum elongation of 18%

Circle 512 on postcard, page 33

Time-Saving Power For Your Shop or on the Job...



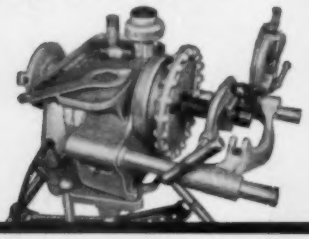
New RIDGID 300 Power Drive

Lightweight • Versatile • Low in Price

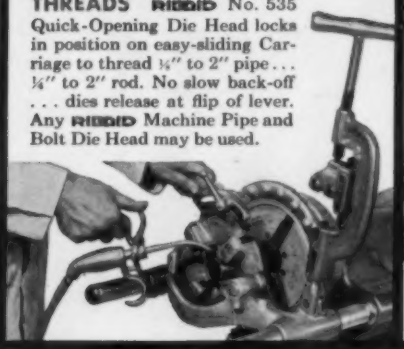
Bench, stand or truck mounted, this compact RIDGID 300 Power Drive gives you time and labor-saving power for your hand cutters, threaders or reamers. Add the RIDGID No. 310 Carriage, No. 360 Cutter and a RIDGID Quick-Opening Machine Die Head, and you have *low-cost threading machine speed and ease!*

Here's What it Does!

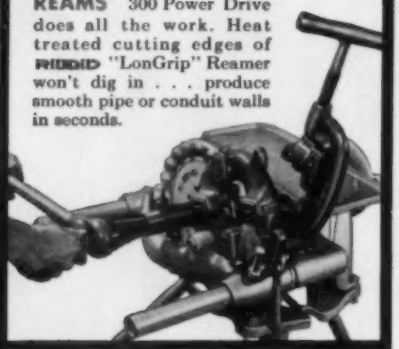
CUTS RIDGID No. 360 Cutter, shown here, cuts ⅛" to 2" pipe and conduit — up to ⅝" rod. Extra-wide rolls keep cutter straight for perfect high-speed tracking. Cutter stays back out-of-way when not in use.



THREADS RIDGID No. 535 Quick-Opening Die Head locks in position on easy-sliding Carriage to thread ¼" to 2" pipe... ¼" to 2" rod. No slow back-off ... dies release at flip of lever. Any RIDGID Machine Pipe and Bolt Die Head may be used.



REAMS 300 Power Drive does all the work. Heat treated cutting edges of RIDGID "LonGrip" Reamer won't dig in ... produce smooth pipe or conduit walls in seconds.



DRIVES GEARED THREADERS Compact, RIDGID No. 300 Power Drive has plenty of power for up to 12" geared tools. New RIDGID Close-Coupled drive shown here, for Nos. 141 and 161 Jam-Proof Threaders eliminates Universal Drive Shaft ... saves working space.

THREADS CLOSE NIPPLES

No. 310 Carriage is so designed that by using a RIDGID No. 19 Nipple Chuck you can thread even close nipples right on the job... no waiting for nipples of special lengths.

AND IS EASY TO MOVE With the aid of the Transporter, one man can easily move a RIDGID 300 Power Drive with its No. 1206 Folding Stand attached. Set-up is fast and easy. Stand's integral tool tray locks legs in position, forming rigid work base.

Save Time and Increase Your Profits on Every Job. See and Try This Biggest "Threading Machine" Bargain at your Supply House!

RIDGID

The Ridge Tool Company, Elyria, Ohio, U.S.A.

Circle 513 on postcard, page 33

SILICONE NEWS from Dow Corning

Blueprint for Reliability

For Performance Plus...Specify Silicone Insulated Transformers

Here's Why—(1) *Low cost installation* . . . transformers using silicone insulation systems are up to 50% lighter, 50% smaller and require no costly vaults or barriers. (2) *Lower operating costs* . . . silicone insulated transformers are virtually maintenance-free — have no liquids to filter or change — need no space heaters to keep de-energized windings dry. (3) *Maximum safety* . . . silicone insulated transformers are completely dry. There's no danger of toxic fumes, or fire. (4) *Maximum reliability* . . . silicone insulated transformers operating at 200 C have a longer life expectancy than Class A transformers operating at 100 C. Depending on design, silicone insulated transformers withstand overloads of 25 to 50% above rated capacity. Units have been flooded without damage to windings.

Here's How — Dow Corning silicone insulation has excellent electric strength and is unaffected by thermal cycling and high temperature . . . enables transformer manufacturers to (1) produce lighter, more compact units — units that double capacity without increasing space or weight requirements; or (2) build units that withstand substantial overloads.

Here's What — Silicone insulated dry-type transformers in three enclosures: (1) open, (2) enclosed and (3) gas-filled sealed.

Here's Where — For load center substations, a choice of enclosed, open or sealed gas-filled dry-type transformers that require no costly vaults—can be located on roofs or balconies to conserve valuable floor space.

Here's When — Right now! Whether you are planning for future growth, expanding present facilities or replacing old equipment, consider the possibility of using silicone insulated transformers. Initial price is competitive, and, when you consider their lasting values, silicone insulated transformers give you more for your money . . . a whole lot more!

Write today for 8 page brochure entitled "Specify Silicone Insulated Motors and Transformers and Save!"

You Save by Specifying Silicone Insulated Transformers. Write Dept. 0824.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

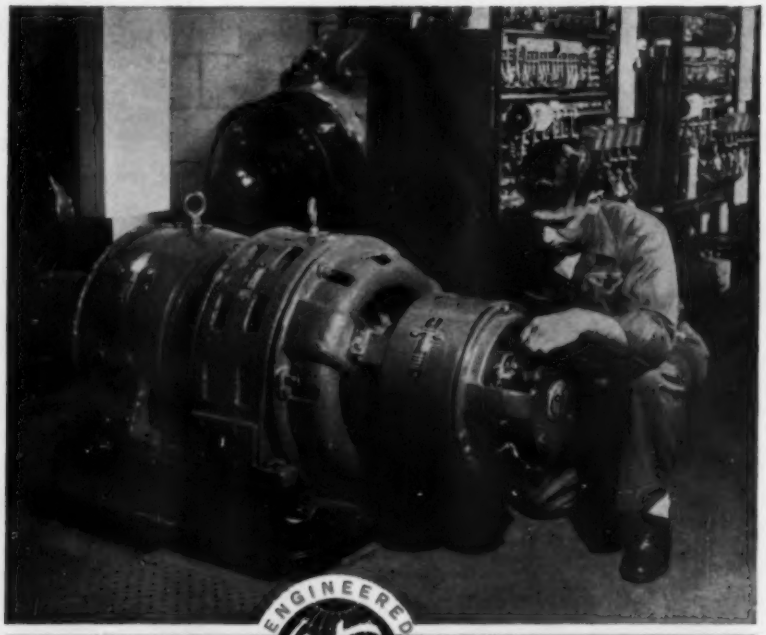
Circle 514 on postcard, page 33

Otis

FOR UNINTERRUPTED ELEVATOR SERVICE

NESTLÉ'S USES 11 OTIS FREIGHT ELEVATORS in its production lines where chocolate manufacturing is an art that depends on machinery. Uninterrupted production depends on alert maintenance of a vast variety of machines: roasters, grinders, giant hydraulic presses, conches, fast moving conveyors, packaging machines – and elevators. NESTLÉ'S own engineers keep the chocolate manufacturing machinery in mint condition. The elevators are the responsibility of local OTIS engineers.

Is elevator maintenance complex? Yes! It is an organization task requiring an unusual combination of skills. Plus a wide knowledge of parts, assemblies, functions, replacement procedures, testing and adjusting. Plus the availability of original replacement parts. Plus immediate service in emergencies.



freight ENGINEERED Otis MAINTENANCE elevators

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.

NESTLÉ'S

FOR UNINTERRUPTED CHOCOLATE PRODUCTION

ONE MILLION POUNDS OF CHOCOLATE PRODUCTS DAILY. The Fulton, New York plant of The Nestlé Company, Inc., often ships one million pounds of chocolate products daily: Chocolate Bars, Quik Milk Drink, EverReady Cocoa, Chocolate Coatings and Syrups.

OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

Circle 515 on postcard, page 33

Location: Natural Science Building, Western Michigan University, Kalamazoo, Michigan
Architect:
Louis C. Kingscott & Associates, Inc., Kalamazoo, Indianapolis, Davenport
Electrical Contractor:
Hall Electric Company, Muskegon, Michigan
Time and Motion Study:
S. M. Dix and Associates, Grand Rapids, Michigan

Installed: 5-foot Westinghouse plug-in low impedance bus duct

Two men, a pair of open-end wrenches, a screwdriver and only 7 minutes, 13.2 seconds was all it took to put a 5-foot section of Westinghouse 3-phase, 440 volt, 1600-amp bus duct in service on this job.

New Westinghouse plug-in low impedance bus duct is ideal wherever power is used in commercial, industrial and institutional buildings. Factory-installed joint hardware and plug-in power take-offs simplify the entire installation and reduce cost.

J-30332

Time:
7 minutes,
13.2 seconds

In addition, it's completely salvable, compact and neat in appearance.

To figure jobs with the sharpest pencil, to complete a quality installation at top speed, contact your Westinghouse sales representative about new Westinghouse plug-in low impedance bus duct. Or, write: Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.

Westinghouse

Circle 516 on postcard, page 33

HELPFUL WATER CONDITIONING DATA FROM BETZ

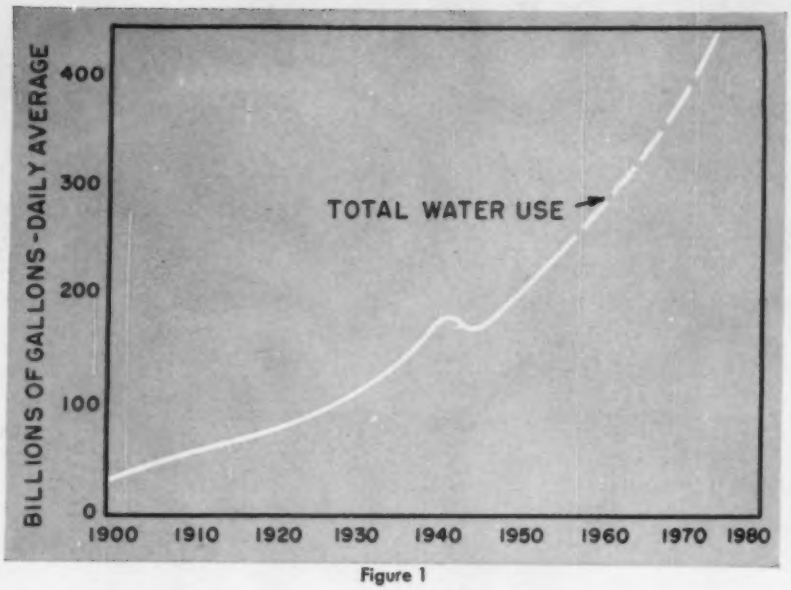


Figure 1

WASTING WATER IN YOUR

There are ample opportunities for the conservation of water in most industrial plants

WATER IS ONE of our most vital resources. Considerable concern has been expressed from time to time over the adequacy of our water resources. This concern is justified because of the enormous current water usage and the rate of increased usage predicted for the future as shown by Figure 1. The current water usage by industry alone is estimated as 70 billion gallons per day. It is anticipated that daily usage will soar to 115 billion gallons by 1975. Water requirements for various industries are typified by the data presented in Figure 2. With an expanding population and industrial growth it is important that serious attention by industry be given to the conservation and reuse of our water resources.

Industrial plants that are located in drought areas have been forced to cope with a water shortage problem much sooner than anticipated. In some of these cases, sewage plant effluent has been used for makeup to boilers and recirculating cooling water systems. The problems encountered in the treatment of sewage plant effluent to make it suitable for these purposes is thoroughly covered by Betz Technical Paper No. 138, a copy of which is available on request.

Many industrial plants located in other areas where water supplies have been considered adequate and inexhaustible, have found it profitable to conduct surveys of their water usages. Often, surveys of this type uncover unnecessary water losses, inefficient operations and equipment obsolescences. The correction of these conditions has led to a saving not only in water, but of dollars as well. A recent survey conducted at a chemical processing plant dramatically illustrates what can be done.

TYPICAL WATER REQUIREMENTS

Industry	Gallons per Tons
PETROLEUM	35,000
STEEL	65,000
PAPER	70,000
RUBBER	30,000

Figure 2

Case History

A chemical processing plant, considering an expansion program, found that the water supplies might not prove adequate for the anticipated operating conditions. The normal source of well water was already being supplemented by the use of city water which was already in short supply. One of the three wells normally used had been abandoned because of evidence of salt water intrusion. A simplified flow sheet of water usage for the plant is illustrated by Figure 3.

The survey revealed that a large quantity of hot condensate was being dumped to waste because of frequent contamination from process evaporators which introduced foam producing materials into the condensate. When this condensate returned to the boilers, severe boiler water carryover occurred.

Trouble also occurred with the lime-soda softener. The supplemental use of city water along with the normal well water created such a wide variation in makeup water characteristics that it was impossible to maintain proper balances. These poor balances resulted in the need for frequent backwashing of the filters and the maintenance of an abnormally high blowdown rate on the boilers.

The recirculating cooling water system contained numerous bleed-off points for miscellaneous water usages which made it uneconomical

to treat the system for prevention of corrosion. The corrosion products that accumulated were interfering with heat transfer, requiring added water flow to maintain process temperatures.

Briefly, the corrective measures applied involved the application of an *antifoam to the process evaporators* which eliminated contamination of the condensate. As a safety measure, however, an alarm system was installed which also operates a valve to divert the condensate, if and when contamination occurs. The return of the hot condensate materially reduced makeup requirements to the boiler so that the available city water proved more than adequate to handle boiler makeup requirements for the proposed operating conditions. With the use of city water alone for makeup to the boilers, uniform softener balances have been maintained and the filter backwash and boiler blowdown have been reduced to normal requirements.

Savings in heat, water treatment and water requirements far exceed the cost of the process antifoam and the cost of the alarm system used to correct the problem.

In addition, a check of the numerous draw-off points from the cooling system revealed unnecessary waste of water through open-ended hoses used periodically for washing equipment and left running. Cooling water for bearings and compressors was not returned to the main cooling water system. Elimination of these water losses permitted the cooling system to cycle and decreased makeup requirements to the point where the two existing wells could satisfy the water demands. These savings in water, in turn permitted corrosion control treatment to be justified economically. A check of the third well which had been abandoned for evidence of salt water intrusion indicated that the salt content was within a range to permit its use in the cooling system if necessary. This well was connected for emergency use to the cooling system. The effectiveness of the cooling water corrosion control treatment has limited corrosion of the steel parts in the system to less than one mil per year. Design temperatures and normal pressure drops through the heat exchangers are now maintained.

PLANT?

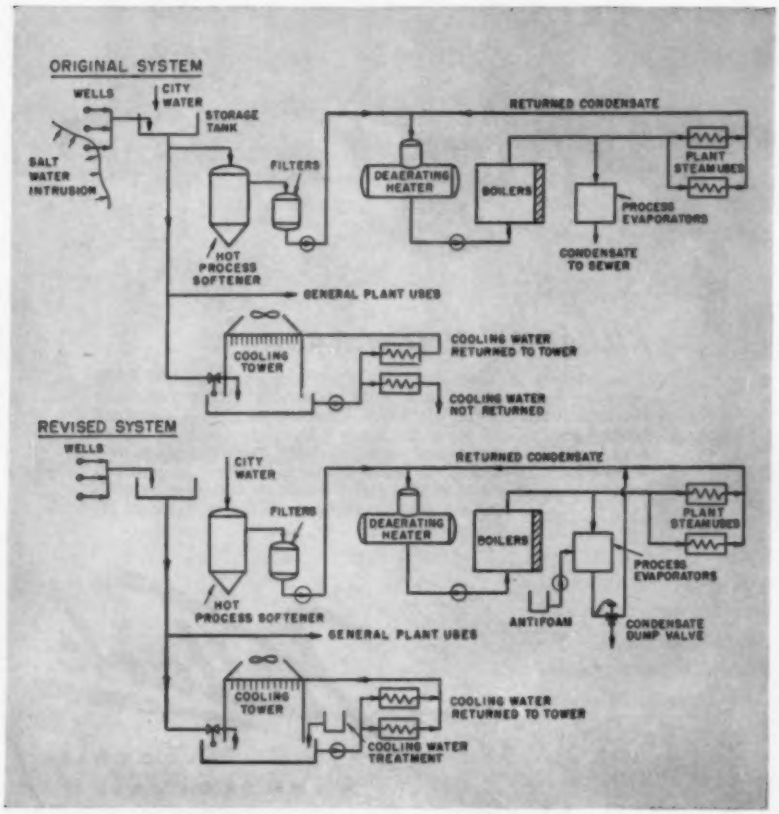


Figure 3

This survey and numerous others conducted by the Betz Consulting Division has revealed that there exist ample opportunities in many plants to bring about water conservation and oftentimes water re-use.

A survey of your plant water usages, treatment methods and water wastes may produce benefits both in water savings and dollar savings. Perhaps a process antifoam may be the answer. Talk it over with the Betz Engineer next time he visits your plant.

BETZ LABORATORIES, INC.
Gillingham & Worth Streets • Phila. 24, Pa.

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

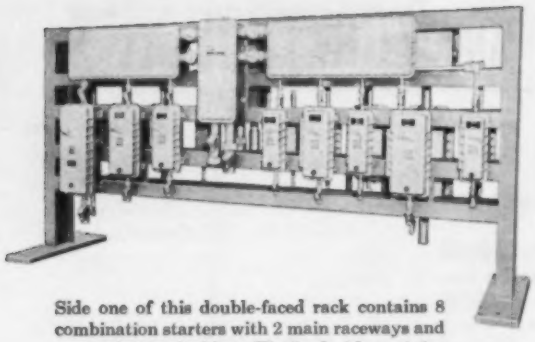
"Are they* delivered ready to install?"

* KILLARK SWITCH RACKS

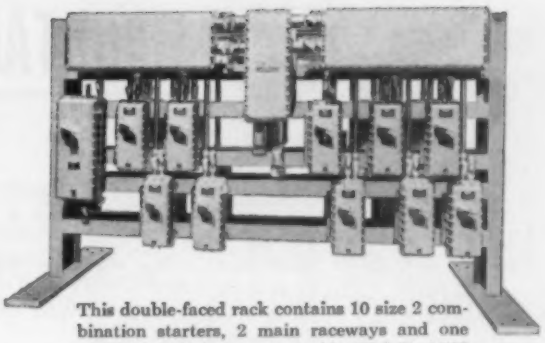
This rack is 20 feet long, 7½ feet high, and weighs 8700 pounds. Side one, shown here, contains 18 combination starters, with wiring through 4 raceways. Main terminal blocks are placed in a junction box. Side two (in back) contains 17 combination starters with terminal box and 4 raceways. Galvanized steel mounting frame is painted with two coats of zinc-rich paint. Built in accordance with N.E.C. Code, Article 500, governing Class 1, Group D, Division 1, hazardous areas.

Killark

ELECTRIC MANUFACTURING COMPANY



Side one of this double-faced rack contains 8 combination starters with 2 main raceways and one main terminal box. The back side contains similar equipment. Total estimated weight 4,952 pounds. Length 15′, height 7′10″.



This double-faced rack contains 10 size 2 combination starters, 2 main raceways and one main terminal box on each side. Weight 4,828 pounds, height 7′10″.

"You bet they are! Designed, assembled, wired, sealed, shipped. Ready to hook up to power."

"Les Sparks"

Killark's Bob Grimm, Assistant Sales Manager, is shown on the opposite page, by one of four (front-back) switch racks recently built for a Texas oil refinery. Two others are illustrated above.

All-aluminum control centers are custom-designed by Killark engineers from the broad selection of Killark enclosures: motor starters, disconnect switches, circuit breakers, panel boards.

Killark switch racks offer several really big advantages. Because they're aluminum, they're lightweight, rust-proof, non-sparking. They're versatile; you can specify them as large or small, as simple or complex as you require. They can be built for indoor or outdoor location, for hazardous or non-hazardous environments. All boxes are ribbed for higher strength and faster heat dissipation, rectangular for more compact assembly, front-opening for easier access and servicing.

Killark does practically all the work for you, from blueprints to assembly to wiring to sealing to shipping. The racks arrive at your plant ready to hook up to your power.

If you would like further information about Killark custom-assembled switch racks, drop us a line and we'll be happy to give you complete details.

Vandeventer and Easton Ave. St. Louis 13, Mo.

In Canada: Killark Electric of Canada, Ltd., 421 Islington Ave. South, Toronto 18, Ont.

Circle 518 on postcard, page 33

"LESS DOWN-TIME SINCE USING LUBRIPLATE LUBRICANTS"

says: TREU HOUSE OF MUNCH INC. of Toledo, Ohio.

"The use of LUBRIPLATE Lubricants has enabled us to operate our trucks with minimum down-time for repairs and parts replacement. Furthermore, we use but *one* Motor Oil, *one* grease and *one* gear lubricant, year round, which greatly simplifies our service program."

Richard A. Esser, Vice-President

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

Circle 519 on postcard, page 33

BACKTALK AND FORETHOUGHTS

Edited by Bea Berghorn

A Burning Question

PLANT ENGINEERING:

"We are interested in obtaining some information contained in an article on burning of plating waste which appeared in PLANT ENGINEERING magazine several months ago. The organization that was using this form of disposal treatment was the Oldsmobile Division of General Motors.

"Would you please send us a copy of the article concerning this treatment." *A. L. DiSalvo, Plant Engineering Dept., Lycoming Div. Avco Corp., Williamsport, Pa.*

■ The article referred to is "Plant Burns Its Cyanide Wastes" which appeared in our June issue. Tear sheets are still available.—*Editors.*

Appreciative—and Appreciated

PLANT ENGINEERING:

"After many years of reading your magazine and receiving your article reprints, you have finally reached the state of perfection in article selection. Would it be possible to receive a reprint of all your lead articles from the September, 1961 issue of PLANT ENGINEERING?

"Your Special Section is exceptional in its content and the other five articles also have applications in our plant.

"Thank you for your service in providing these reprints and congratulations on providing practical and educational material of this nature." *John L. Evers, Building Supt., Continental Can Co., Inc., Chicago, Ill.*

■ These are the laurels that we'd like to rest on . . . but can't if we're to continue to merit such praise. Thanks, indeed, for your kind remarks about the September Industrial Building section. Naturally, we're happy to provide the reprints that you request.—*Editors.*

Calculator to the Rescue

PLANT ENGINEER:

"We are having trouble with the installation of a new lighting system in our plant and while reading a series on Industrial Lighting by Willard Allphin in your December, 1960 issue, we came across a special offer for a free Lighting Calculator by Sylvania. We feel that this calculator would be a great help in making a decision as to the type of lighting that best suits us.

"We would appreciate it very much if you would send us one of these calculators, if they are still available." *Howard C. Eagle, Maintenance Supt., The Welch Grape Juice Co., Inc., Westfield, N. Y.*

■ The calculators have proven to be very popular with our readers and one has been sent to Mr. Eagle—*Editors.*

Parking Lot Information

PLANT ENGINEERING:

"Over the past several years, being a subscriber to PLANT ENGINEERING, I have come across several articles dealing with plant parking lots.

"We have less than one hundred cars to handle in a limited amount of space and without a definite parking layout.

"Can you send me reprints of articles dealing with plant parking layouts and ideas for the small plant." *R. J. Hartenstine, Shop Superintendent, Komline-Sanderson Engineering Corp., Peapack, N. J.*

■ We have sent Mr. Hartenstine several articles that we believe will be of value to him.—*Editors.*

Timely Article

PLANT ENGINEERING:

"The article 'Digital Control Computers' in PLANT ENGINEERING's September issue is very apropos. A group of our people is pursuing a course on Electronic Data Processing at Purdue University. I would very much appreciate your sending me four tear sheets covering the article." *James T. Snow, Plant Engineer, Lever Bros. Co., Hammond, Ind.*

Inquiries About Plastic Foam

PLANT ENGINEERING:

"Kindly forward any information that is available on the watertight plastic foam, 'Compriband'. Your cooperation is appreciated." *G. Schultz, Sales Manager, Ickes-Braun Greenhouse Mfg. Co., Chicago, Ill.*

PLANT ENGINEERING:

"Would you be so kind as to send me any literature you might have on the subject of 'Compriband' referred to in your October, 1961 issue." *Robert J. Winters, Plant Engineering, Motorola Inc., Franklin Park, Ill.*

PLANT ENGINEERING:

"Referring to page 136 of your October issue, I would like to have detailed

FOR THESE APPLICATIONS

Pneumatic Conveying
Glass Blowing
Air Compression
Furnace Blowing
Testing Blocks
Gas Boosting
Cooling
Drying
Gas Exhausting
Scale Blow-off

'BUFFALO' PRESSURE BLOWERS

FOR THESE INDUSTRIES

Chemical
Steel
Glass
Textile
Food Processing

Rugged, ribbed and gas-tight, 'Buffalo' Type CB Pressure Blowers are serving with distinction on a wide variety of applications. Wheels are narrow, heavy-duty steel plate construction, plug welded, riveted or continuously welded for high strength under high pressure service. Housing scroll is continuously welded. Inlet and outlet are flanged. Inlet and scroll are mastic sealed. Special construction is available for high-temperatures, corrosive or explosive atmospheres. Capacities to 37,500 cfm and pressure to 74" w. g. Also a line of Type R High Pressure Blowers for specialized requirements—details on request. Write for Bulletin FI-310.

AIR HANDLING DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

Canada Pumps Ltd., Kitchener, Ontario

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

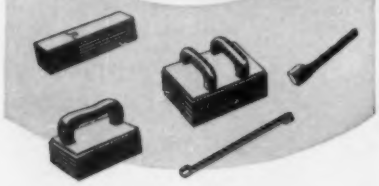
Circle 520 on postcard, page 33

SAVE down-time man-hours and money

keep D.C. motors running longer at lower cost . . .

IDEAL

RESURFACERS refinish commutators and slip rings without dismantling



- Performance matched for every condition
- A size and type for all needs
- Accepted standard for quality and uniformity for over 40 years

NO. 80 IDEAL RESURFACERS for commutators and copper alloy slip rings are made in six grades. Extra coarse—very fast cutting — for "hogging" off excessive copper. Coarse — for fast cutting. Medium for high mica, small ridges and burns. Finish—for finishing after above uses, and removing small burns and ridges. Polish—fine grade for burnishing. Extra Polish—for production finishing of small commutators.

NO. 81 IDEAL RESURFACERS for cast iron and steel slip rings only, in coarse, medium and finish grades as detailed above.

Get the facts on Ideal's complete line of Resurfacers, Flexible Abrasives, Mica Undercutters, Precision Grinders and other accessories. Send coupon for complete Motor Maintenance Catalog.

MAIL COUPON TODAY

IDEAL INDUSTRIES, Inc. (IDEAL)
3879-L Park Avenue, Sycamore, Ill.
Send me Motor Maintenance Catalog.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

SOLD THRU AMERICA'S LEADING DISTRIBUTORS

Circle 521 on postcard, page 33

BACKTALK— FORETHOUGHTS

information concerning this form of polyurethane and a local source of supply.

"Specifically, I am in immediate need of an outdoor horizontal expansion point filler for concrete slab work. Your help in supplying complete details will be appreciated." *L. D. Banta, Plant Engineer, Formica Corp., Cincinnati, Ohio.*

PLANT ENGINEERING:

"Please send us complete information on 'Compriband' the watertight plastic foam." *George A. Nelson, Acting Chief, Research Div., Specifications and Research Service, Veterans Administration, Washington, D. C.*

■ These are just a few of the many inquiries we have received regarding plastic foam. This product was mentioned in the article "Watertight Plastic Foam—A 'Plus' for Construction Jobs" in our October issue. All inquiries have been referred to the manufacturer.—*Editors.*

Approves of Our Editorial

PLANT ENGINEERING:

"Received my copy of the October issue of PLANT ENGINEERING, today, and want to compliment you on your thought-provoking editorial. I feel, personally, that it's just the sort of 'needle' that our plant engineers need regularly.

"The fact that it contains such a nice plug for AIPE naturally increases my enthusiastic approval. Many thanks!" *Kay Buchanan, Administrative Secretary, American Institute of Plant Engineers, Arlington Heights, Illinois.*

Reprints Anyone?

PLANT ENGINEERING:

"We would like very much to have reprints of two articles which appeared in your May 1961 issue.

"The articles are, 'Construction Specifications-Earthwork', page 118, and 'Training Maintenance Weldors', page 123. Your prompt attention to this matter will be greatly appreciated." *Wm. J. Camp, Director, Engineering Dept., Cotton Producers Assn., Atlanta, Ga.*

■ We have sent the tear sheets, as requested by the reader. In case any other readers are interested in the "Training Maintenance Weldors" series, we now have available, the 22-page reprint of this complete five-part series at $1.00 per copy. The series includes Parts I through V, covering types of joints, common weld faults, selecting electrodes, destructive testing of welds and qualification testing procedure. Send your request to the Editor, PLANT ENGINEERING.—*Editors.*

Referred to Author

PLANT ENGINEERING:

"We have read with interest the article 'Equipment Gets Tough Hide for Outdoor Storage' in the August issue of PLANT ENGINEERING.

"Where may we obtain pertinent information relative to the materials and equipment necessary for encapsulation? Can ordinary paint spraying equipment be utilized?

"Incidentally, the article 'Cloth Dust Filters' was certainly well written, and widely read here." *H. B. Minturn, Engineering Services Supt., Ormet Corp., Hannibal, Ohio.*

■ This inquiry has been referred to the author for further information. We always appreciate our readers' kind comments.—*Editors.*

Help With Maintenance Planning

PLANT ENGINEERING:

"Please forward a copy of 'Maintenance Planning and Scheduling' by Dan G. Poppe, which appeared in the March, 1961 issue of PLANT ENGINEERING." *G. L. Cannoles, Supervisor, Work Standards and Methods Engineering, Buick-Oldsmobile-Pontiac Assembly Div., General Motors Corp., Wilmington, Del.*

PLANT ENGINEERING:

"I am interested in obtaining copies of the article 'Small Companies Can Cut Costs, Speed Work Without Complicated Forms or Involved Systems with Maintenance Planning and Scheduling,' by D. G. Poppe. This appeared in the March, 1961 issue of your magazine.

"We need three copies of this article if it is possible." *Leah D. Thomas, Librarian, H. B. Maynard and Co., Inc., Management Consultants, Pittsburgh, Penn.*

■ Tear sheets of this article have been sent with our compliments.—*Editors.*

Static Control

PLANT ENGINEERING:

"Please send me a reprint of the article, 'Static Control in Industry' which appeared in your October issue." *Dale A. Musser, Engineer, The Firestone Tire and Rubber Co., Akron, Ohio.*

Another* Exclusive Vogt Product

THREADED TYPE

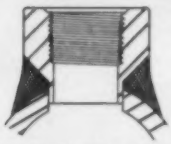
FORGED STEEL WELD COUPLETS

SOCKET WELD TYPE

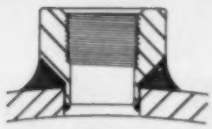
*with Exclusive Vogt "WELD RING"

The Vogt Weld Couplet is an easy-to-install fitting for branch connections from pipe, vessels or tanks. It replaces more-difficult-to-install welding bosses, couplings and the type of fittings requiring trimming or matching to fit contour of vessel or pipe.

Here's How the Exclusive VOGT "WELD RING" Saves Time and Money!



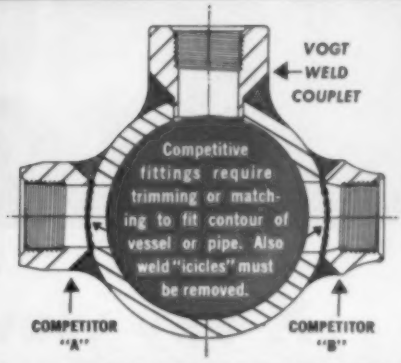
Small Diameter Pipe



Large Diameter Vessel

Vogt Weld Couplets adapt to any pipe or vessel curvature by simply adjusting the height position of the couplet when welding. This characteristic means easy installation, positive positioning and alignment, a stronger weld without distortion, and no inside "icicles" of welding material.

Couplets are available in carbon steel, conforming to A.S.T.M. specifications. Other materials can be supplied on special order.


VOGT
WELD
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Competitive fittings require trimming or matching to fit contour of vessel or pipe. Also weld "icicles" must be removed.
COMPETITOR "A"
COMPETITOR "B"

Write for Folder SWC-1 to Dept. 24A-FPLE.

Vogt VALVES, FITTINGS FLANGES & UNIONS

See our complete line in Catalog F-10

HENRY VOGT MACHINE CO., P. O. Box 1918, Louisville 1, Kentucky

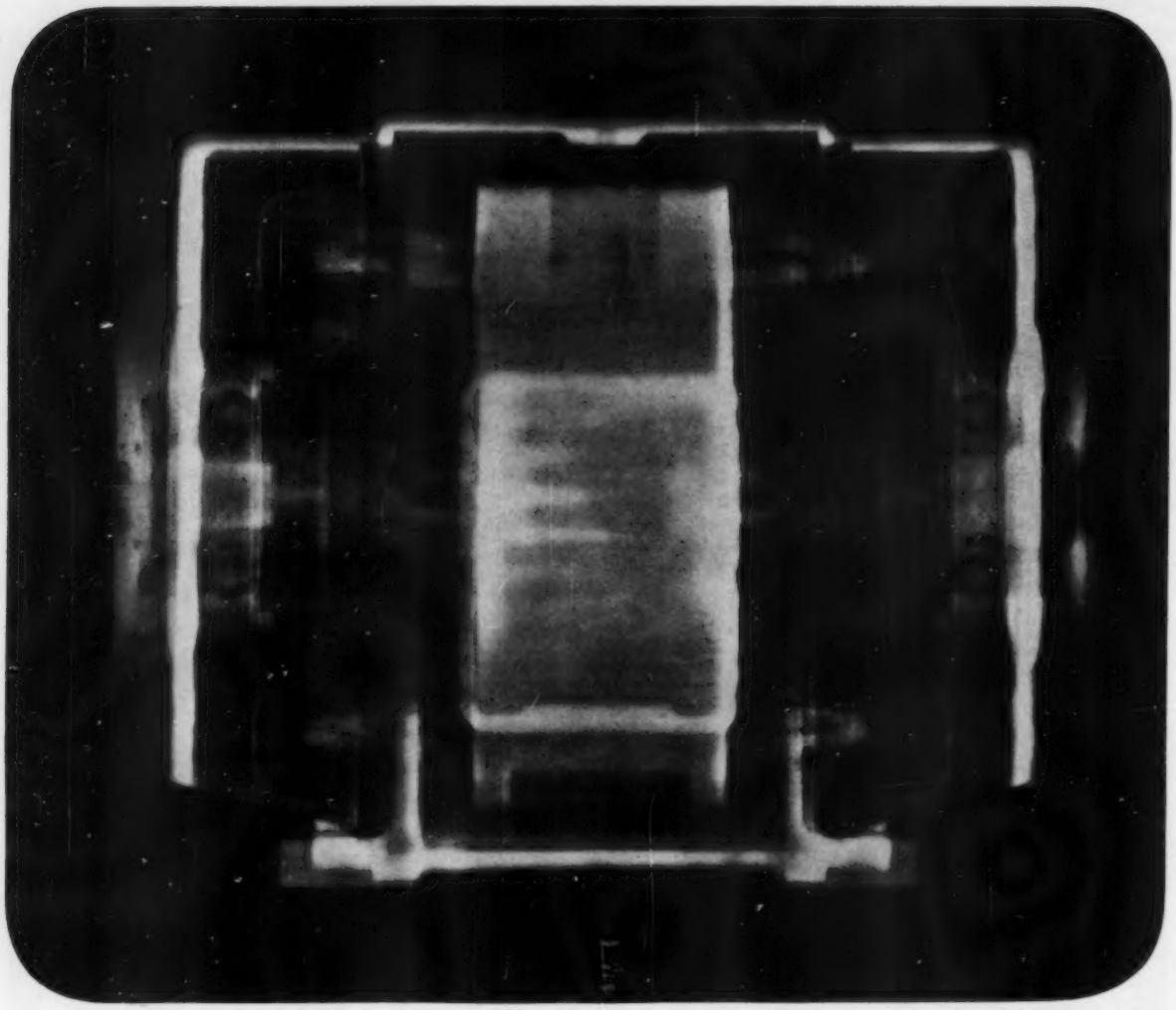
SALES OFFICES: Camden, N. J., Charleston, W. Va., Chicago, Cleveland, Dallas, Los Angeles, New Orleans, New York, San Francisco, Seattle, St. Louis

For Direct Long Distance to Louisville dial: 502 ME 4-9411

Circle 522 on postcard, page 33

ALLIS-CHALMERS

A-1508



Actual radiograph of a 5-hp open-type motor taken with a 24-million volt Allis-Chalmers Betatron.

X-ray view of motor health

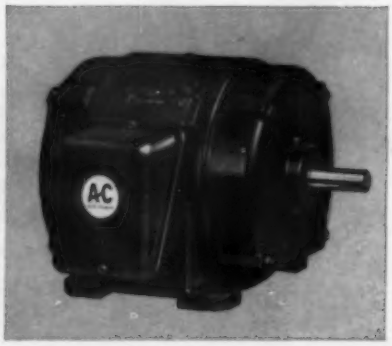
Invisible standards of perfection increase life expectancy of every Allis-Chalmers motor

The exceptionally long performance of A-C open motors proves the value of thinking *beyond* established standards of design . . . of taking "significant new achievement" as the ideal.

This ideal led to many refinements for A-C open motors: double-shielded bearings that keep dirt out and allow controlled migration of grease, permanently numbered leads for easy identification and connection, and heavy-duty cast iron frames that resist corrosion and keep rotating parts perfectly aligned.

For totally-enclosed, open-type and *Super-Seal* general purpose motors, and electrically or mechanically modified definite-purpose motors, choose the motor built to invisible standards of perfection. Choose A-C. Special application help available.

Call your nearby A-C representative. Or write **Allis-Chalmers,** *Industrial Equipment Division, Milwaukee 1, Wis.* Super-Seal is an Allis-Chalmers trademark.



Circle 523 on postcard, page 33

BULLETINS

JUST RELEASED and OF IMMEDIATE PLANT INTEREST

SAFETY

Preventing Furnace Explosions

Causes of furnace explosions and corrective methods and recommendations for safe operating procedures are outlined in 16-pp Bulletin E-101. The Babcock & Wilcox Co.

For a copy, circle 101 on Post Card

Protection for Combustion Lines

Bulletin B-10, 12 pp, describes operations and features of Fire Guards for flammable and combustible line protection. C. M. Kemp Mfg. Co.

For a copy, circle 102 on Post Card

Fire Pump Protective Units

What to consider in selecting protective equipment is covered in 8-pp Pub. LJ25, on fire pump controls. Requirements of underwriters associations and fire insurance companies are listed. Cutler-Hammer Inc.

For a copy, circle 103 on Post Card

Burnoff System for Fumes

Capabilities and physical properties of the Pyron burnoff system are described in this 6-pp brochure, telling how it detoxifies efflux gases or liquids. Avien, Inc.

For a copy, circle 104 on Post Card

Special Purpose Clothing

This 28-pp handbook presents uniforms of lint-free acid resistant synthetic fabrics. Complete with test data, fabric properties and glossary of fabric terminology, this book describes and pictures available garments; also includes fabric swatches. Fashion Seal Uniforms.

For a copy, circle 105 on Post Card

Guide to Hand Protection

This 8-pp illustrated bulletin describes 69 types of gloves, hand pads, mitts and sleeves made of pile fabric designed for longer wear, less shrinkage and resistance to common industrial hazards. Keller Glove Mfg. Co.

For a copy, circle 106 on Post Card

PUMPING

Glassed Centrifugal Pump

Bulletin 725.3 describes pump with bonded glass covering surfaces contacting pumpage. Goulds Pumps, Inc.

For a copy, circle 107 on Post Card

Versatile Proportioning Pumps

Twelve-pp Bulletin 861 describes both standard and Strokontrol proportioning pumps, emphasizing adjustment and other advantages of the Strokontrol design. Capacity and selection tables. Jaeco Pump Co.

For a copy, circle 108 on Post Card

Pumps and Control Components

Bulletin 47740, 20 pp, shows how electrohydraulic servo controlled pumps and system components work, what functions they perform, and where they apply. The Oilgear Co.

For a copy, circle 109 on Post Card

VALVES, PIPING

New Concept in Ball Valves

Bulletin PB911 describes a new design in Ludeman Rotoflo valves for critical applications involving high pressure and temperature, and radioactive environments. Specifications included. General Kinetics Corp.

For a copy, circle 110 on Post Card

Bonnetless Knife Gate Valve

Bulletin 302, 8 pp, describes a rubber-seated knife gate valve. Features, materials and dimensions are listed. DeZurik Corp.

For a copy, circle 111 on Post Card

Why Proper Valve Sizing

This technical paper explains dangers of oversizing and undersizing valves for pressure reducing applications. Jordan Valve.

For a copy, circle 112 on Post Card

Steel Pipe at Work

Steel pipe in the world of structures, building construction, electricity, temperature control, petrochemicals, design etc. is discussed and illustrated in this 28-pp brochure. Also covered are advantages and mechanical properties. Wheeling Steel Corp.

For a copy, circle 113 on Post Card

Solutions to Piping Problems

Bulletin 32 describes use of self-aligning swivel joints in connecting flexible steam and water lines to moving parts of rubber and plastic molding and laminating presses and platen presses. Barco Mfg. Co.

For a copy, circle 114 on Post Card

Spring-Actuated Pipe Hangers

Counterpoise and Levelglide pipe hangers are described in 16-pp Bulletin 157. Travel-load capacities of each type are charted. National Valve & Mfg. Co.

For a copy, circle 115 on Post Card

PACKINGS, GASKETS

Molded Packings

Catalog MP-361, 8 pp, describes packings for pumps, compressors, and other hydraulic and pneumatic equipment. Tables list compounds in which each packing is furnished for various fluids etc. Greene, Tweed & Co.

For a copy, circle 116 on Post Card

Dependable Gaskets

Bulletin PK-152A, 28 pp, describes six basic designs of Goetze metallic gaskets, covering such selection data as "where recommended," "how they work," "why suggested," and "what constructions are available." Selection charts. Johns-Manville Corp.

For a copy, circle 117 on Post Card

CONSTRUCTION

Construction With Steel

Versatility of steel as a building material is illustrated in case histories of typical applications. Structural shapes, steel piling, plates, reinforcing bars, shown in full color in Bulletin 544. Bethlehem Steel Co.

For a copy, circle 118 on Post Card

Cold Weather Concreting

Do's and don'ts of coldweather concreting, covering use of forms, subgrading, curing, etc., are given in this placard. Includes informative charts and nomograph to tell what temperature mix water to use. The Master Builders Co.

For a copy, circle 119 on Post Card

Concrete Facts

Pozolith's ability to give concrete increased flexural bond, workability, durability, and other advantages, is described in 6-pp Bulletin P-36C. The Master Builders Co.

For a copy, circle 120 on Post Card

Pre-Faced Masonry Units

Properties, cost and decorative advantages, architectural specifications and application standards of Glazon structural units are presented in this 8-pp bulletin. Color photos show standard colors, several installations. Glazon Corp.

For a copy, circle 121 on Post Card

Postage-free cards for ordering Bulletins are on pages 33-34. You may also use the cards to order literature mentioned in the ads.

Porcelain Enameled Panels

Typical applications of porcelain enameled architectural panels in a variety of buildings are illustrated and described in 8-pp Bulletin CAP-6250. Caloric Appliance Corp.

For a copy, circle 122 on Post Card

Glass for Comfort, Safety

Bulletins describe Comfor-Lite, a louvered screen sealed between panes of glass that screen out sun's heat and glare, Twi-Lite, a glare reducing, laminated safety glass, and Acousta-Pane, a new concept in sound control. Amerada Glass Corp.

For a copy, circle 123 on Post Card

Glass for Cooler, Softer Light

Features and advantages of Coolite heat absorbing, glare reducing glass, are described in 12-pp Bulletin 5M-11-58. Installation instructions and

BULLETINS

(Begins on page 31)

selection factors are covered. Mississippi Glass Co.

For a copy, circle 124 on Post Card

Glass Tinting Material

Applications and specifications of a tinting material which can be applied to existing glass areas are covered in Bulletin F-301A. Glare reduction table. Sun-X International, Inc.

For a copy, circle 125 on Post Card

Cellular Glass Insulation

Twenty-pp Catalog FB-108 deals with use of Foamglas and Foamglas-board. Contains information on use in roofs, curtain walls, core walls, wall linings, ceilings, parking decks and perimeters. Pittsburgh Corning Corp.

For a copy, circle 126 on Post Card

To Hear and Be Heard

Twelve-pp Booklet GC-5 deals with effectiveness of Geocoustic—a cellular glass acoustical unit employing the "patch" technique—in various applications. Explains necessity of sound control and importance of sound absorption and diffusion. Pittsburgh Corning Corp.

For a copy, circle 127 on Post Card

Improved Sound Barriers

Advantages of sound barriers employing lead are discussed in this 12-pp booklet. Provides sound transmission test data and explains how lead can be used as an acoustical material. Lead Industries Ass'n.

For a copy, circle 128 on Post Card

Slip-Proof Safety Tread

Described in this product bulletin is a pressure sensitive safety tread available in cleats or strips for stairways, ladders, fire escapes, or for any safety tread problem in industry. The Carborundum Co.

For a copy, circle 129 on Post Card

STORAGE EQUIPMENT

Steel Equipment Color Guides

These two color guides for selecting steel and shelving contain samples of the finishes. Advantages of the phosphatized finish are detailed. Penco Div., Alan Wood Steel Co.

For a copy, circle 130 on Post Card

Steel Storage Racks

Details, dimensions and loading information on standard and adjustable pallet racks, bar and pipe stock racks, wire coil racks are included in Folder 655. Bethlehem Steel Co.

For a copy, circle 131 on Post Card

Storage Planning Guide

Catalog 720, 48 pp, for selecting space saving storage equipment, presents equipment for storing everything from tiny parts to palletized loads. Illustrates Rotabins, bulk storage units, boltless shelving, standard parts bins, racks, etc. Can be used as a guide to lay out a new storage area or revise existing ones. Frick-Gallagher Mfg. Co.

For a copy, circle 132 on Post Card

MATERIALS HANDLING

Lightweight Electric Conveyor

Portable, multi-purpose all-aluminum conveyor which carries loads horizontally or on an incline is featured in Bulletin 600. A-B Farquhar Div., Conveyor Systems, Inc.

For a copy, circle 133 on Post Card

Electric-Powered Material Handling

Features and advantages of a high-stacking walkie with a built-in charger is described in a 6-pp circular and three installation bulletins. Lewis-Shepard Products, Inc.

For a copy, circle 134 on Post Card

Versatile Lift Trucks

Construction and features of lift trucks are described in 24-pp Catalog BU-680, sectionalized and keyed for quick reference. Data covered includes power, operating advantages. Engine-Material Handling Div., Allis-Chalmers Mfg. Co.

For a copy, circle 135 on Post Card

Lifting Without Surface Damage

The Swing Sling that lifts loads safely is described in Bulletin WR-744-5M. The Colorado Fuel & Iron Corp.

For a copy, circle 136 on Post Card

Handling and Shop Equipment

This 52-pp catalog lists wide selection of new and used handling and storage equipment, plus steel furniture and accessories with prices quoted. Among products listed at substantial savings are lift trucks, stackers, skid platforms, conveyors. Industrial Handling Equipment Co.

For a copy, circle 137 on Post Card

Pulsating Magnetic Vibrators

Featured in 12-pp Bulletin 81461 are electric vibrators designed to promote free flow of materials through bins, hoppers and chutes, as well as pneumatic and hydraulic vibrators. Syntron Co.

For a copy, circle 139 on Post Card

Collapsible Welded Wire Containers

Features and applications of collapsible containers for metalworking, textile, electrical and other industries are detailed in 16-pp Bulletin C-101. Includes information on pallets and welded wire conveyor guard. Tri-State Engineering Co.

For a copy, circle 140 on Post Card

DUST, FLY ASH CONTROL

Self-Contained Dust Collectors

Equipment for control and collection of industrial dusts in metalworking, woodworking, etc., is featured in Bulletin 230. Describes functions of cyclone separators, fabric filters and combination. John Wood Co.

For a copy, circle 141 on Post Card

Cloth Bag Dust Collector

Operation of a cloth bag filter for smaller volume applications is detailed in Bulletin 916. Schematic diagrams and dimensional data included. Pangborn Corp.

For a copy, circle 142 on Post Card

Fly Ash Collector Systems

Illustrated and described in Bulletin RC 553 are three types of systems—straight electrical precipitator, mechanical collector, and combination electrical-mechanical collector. Research-Cottrell, Inc.

For a copy, circle 143 on Post Card

ELECTRICAL

Turbine Pump Motor Guide

This 28-pp handbook of instructions assists users of Holloshaft turbine pump motors to obtain optimum operation. Installation, operation, maintenance and repair are covered. U. S. Electrical Motors Inc.

For a copy, circle 145 on Post Card

Stored-Energy Switchgear

Bulletin 2800-2B, 38 pp, describes 4.16- and 13.8-kv circuit breakers and switchgear, giving details on stored-energy closing systems, face-wound blowout coils and closed-door drawout. I-T-E Circuit Breaker Co.

For a copy, circle 147 on Post Card

Contactors and Starters

Features and applications of contactors and starters for air conditioning, refrigeration, and resistance heating are described in 12-pp Bulletin GEA-7316A. Engineering data, dimensions given. General Electric Co.

For a copy, circle 148 on Post Card

Explosion-Proof Panelboards

Bulletin 661, 28 pp, describes outstanding features in two series of explosion-proof panelboards. Stresses compact design, light weight and easy installation and maintenance. Panelboards described include plug-in pivot type and a low cost, one-piece two-compartment panelboard. Appleton Electric Co.

For a copy, circle 149 on Post Card

High Temperature Wires, Cables

Within the 29 sections of this 58-pp catalog are synopses of government and other specifications, new product highlights, UL listings and ratings, dimensions, dielectric strength and temperature ratings. Covers magnet wire, hook-up wires, miniature Teflon lead wire, Teflon tubing, cables etc. Hitemp Wires Co.

For a copy, circle 150 on Post Card

Power Supply Selection Aid

Standard and custom-engineered power supplies, from 50 w to 5,000 kw, are described in this 44-pp catalog, including suggested applications for units, diagrams, and a glossary of power-supply terms. Basic power supply and control evaluation chart provided, along with an electro-plating guide. American Rectifier Corp.

For a copy, circle 151 on Post Card

(More Bulletins on page 208)

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Use this space to ask for tear sheets or other information.

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PLEASE THINK OF THE NEXT READER! When removing the first card from this sheet please remove it with care. One of the "pass-along" readers may wish to request bulletins, information, tear sheets or reprints. The redesigned "fire stop" in the perforations makes it easy to remove one card without disturbing the other.

FIRST CLASS
PERMIT No. 11
BARRINGTON, ILL.

BUSINESS REPLY CARD

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY—

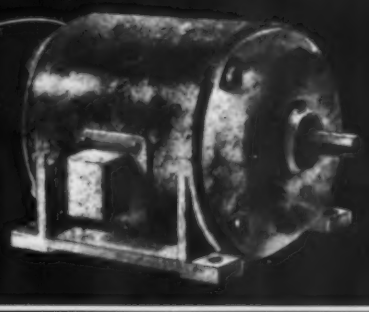
Plant Engineering

308 EAST JAMES STREET

BARRINGTON, ILLINOIS

REPAIR

Motor failed. Insulation damaged by overheating. Cause: Undervoltage



REPLACE

Electronic tubes and incandescent lamp bulbs burned out--Overvoltage

REJECT

Paint blistered and scorched in infrared drying oven as a result of Overvoltage

Victims of voltage vandalism

Increase production-line efficiency, product quality, and plant profits with General Electric Inductrol® voltage regulators

Repair! Replace! Reject! When voltage plays pranks, production-line efficiency suffers. Machines fail. Lighting efficiency drops. Computers give wrong answers. Motors overheat. Electronic tubes burn out.

These and other costly results of voltage vandalism can be avoided by the use of General Electric Inductrol voltage regulators. And only Inductrol regulators give you all these important advantages:

- Automatic ±1% control accuracy
- Stepless, drift-free control
- 100% overload capacity up to 1 hour
- 97 to over 99% efficiency
- Load, power-factor and frequency compensated
- No harmful waveform distortion
- Rugged, compact construction

Inductrol regulators are available in three basic types—automatic, motor-driven and hand-operated—and in a wide range of ratings. For full information, call your G-E Sales Engineer. Or write for Bulletin GEC-1450 to General Electric Co., Section 457-08, Schenectady 5, N. Y. *Voltage Regulator Products Section, Pittsfield, Mass.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle 524 on postcard, page 33

Circle 525 on postcard, page 33 ➔

Wall-mounting of this compact QHT transformer provides bonus floor space for equipment and personnel.

Lighter, smaller General Electric QHT transformers give bonus floor space

The new General Electric QHT dry-type transformers save you production space because they offer savings up to 50 percent in weight and 67 percent in size compared with competitive dry-types. QHT units up to 75 kva have built-in provisions for wall mounting, and larger units can be set in out-of-the-way places near the load, saving the cost of long, low-voltage feeders.

A new insulation system permits use of smaller coils to reduce size and weight of QHT transformers. Inorganic silicone impregnated insulation is highly resistant to water, dust, and corrosive atmospheres. Also, aluminum conductors and cold-rolled, grain-oriented silicone steel combine to give you a smaller, lighter, quiet transformer designed for years of dependable service.

QHT dry-type transformers are easy to install. Units have conveniently placed, dual-sized knock-outs, large terminal compartments and wiring spaces. All wiring can be done from the front.

QHT transformers are quiet—at least 15 decibels quieter than older designs. All have sound levels equal to or less than NEMA standards.

You can get 24-hour delivery on most models from your nearby General Electric distributor. Call him for complete information, or write for GEA-6907A "QHT Specifier's and Buyer's Guide" to Section 411-16, General Electric Co., Schenectady 5, N. Y.

® Registered trademark of General Electric Company for quiet, high-temperature dry-type transformers.

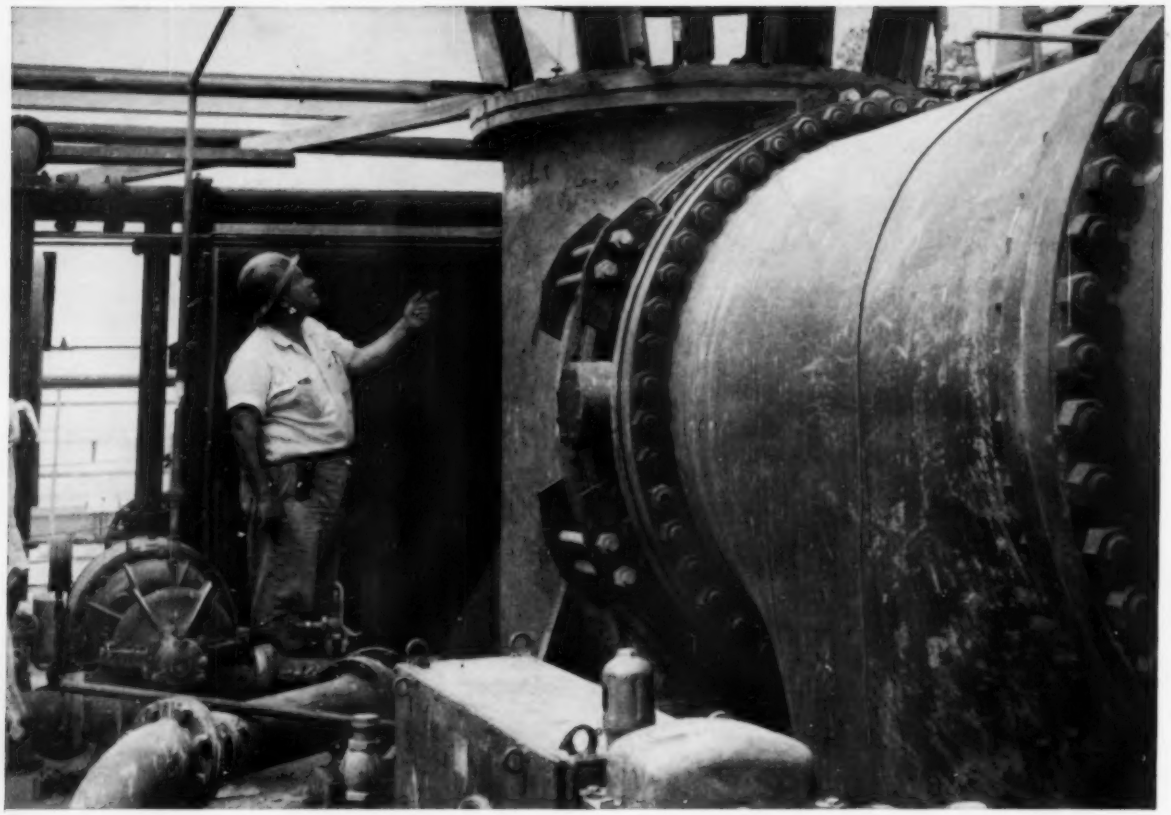
Progress Is Our Most Important Product

GENERAL ELECTRIC

COMPARE . . . G-E Transformers are 32% to 67% smaller

	NEW QHT	TRANS. "A"†	TRANS. "B"†	TRANS. "C"†
45 KVA				
Height (in.)	26 1/4	41 1/4	30	32
Width (in.)	24	28 5/8	31	22
Depth (in.)	19	26	19	28 1/2
Weight (lbs)	430	780	790	500
Volume (cu. in.)	11,970	30,695	17,670	20,064
225 KVA				
Height (in.)	44 1/4	60	50	66 3/4
Width (in.)	41	54	56	55
Depth (in.)	24 3/4	30	28	37
Weight (lbs)	1500	2300	3000	2500
Volume (cu. in.)	44,902	97,200	78,400	135,836

† Transformers "A," "B," and "C" represent products of well-known transformer manufacturers. Data was taken from current published information.



Through this pipe 171 billion gallons of brackish water have passed...

Nickel Cast Iron provides strength, combats corrosion

Every hour of every day for the past three years, this pump has handled 6½ million gallons of water for the cooling and condensing systems of a Virginia power station. The water has a salt range of 11.4 to 27.2 parts per thousand.

Among the steps taken to assure economical equipment performance was the employment of 2% nickel cast iron for the huge pump column, diffuser bell and elbow. The divided water boxes in the condenser are also made of 2% nickel class 40 grey iron.

Nickel improves properties

The nickel cast iron provides improved tensile and compressive strengths over regular grey iron. It helps assure a uniformly dense grain structure, increasing pressure tightness. It also affords greater resistance to graphitic corrosion.

Through the use of Nickel, alone or in combination with other alloying ingredients, the engineering properties of cast iron can be controlled to meet many combinations of service requirements. Would you like complete information? Write us for a copy of "Engineering Properties and Applications of Nickel Cast Iron." A postcard will do it.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street INCO New York 5, N. Y.

TYPICAL ENGINEERING PROPERTIES OF NICKEL CAST IRONS

Class	30	40	50	60
Tensile Strength, p.s.i., min.	30000	40000	50000	60000
Compressive Strength, p.s.i., min.	110000	130000	145000	165000
Torsional Strength, p.s.i., min.	34000	47000	60000	73000
Modulus of Rigidity, p.s.i., typical	$5x10^6$	$5.6x10^6$	$6.2x10^6$	$6.8x10^6$
Impact Strength, Izod AB, ft.lb.*, typical	26	35	43	52
Hardness BHN, typical	200	230	260	290

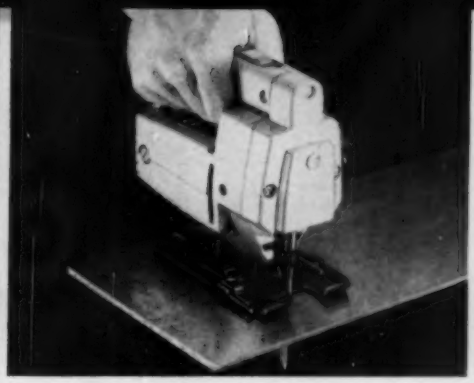
*The numbering system is similar to that used in A.S.T.M. Spec. A48-48.

INCO NICKEL

NICKEL MAKES CASTINGS PERFORM BETTER LONGER

Circle 526 on postcard, page 33

NEW IDEA—Electric Hacksaw! Has 2 speeds for cutting all metals from stainless and cast iron to mild steel, non-ferrous metals (Model 701).



NEW IDEA—2-Speed Jig Saw! World's fastest—high speed for cutting wood, plastic, composition; low speed for metals (Model 160).

NEW IDEA—"Burnout-Protection" Motors. New ultra powerful saw motors backed by full year free service policy (on all Skilsaw circular saws).

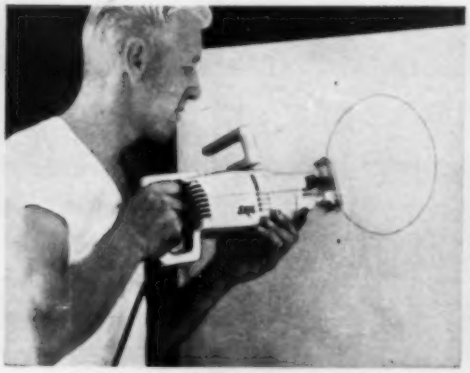
9 Do you know about these NEW SKIL Power Tool ideas?

NEW IDEA—Treaded Disc Sander Pad. Prevents disc slippage. Quick change nut locks on steel pins—no clogged threads (all Skil Disc Sanders).

NEW IDEA—2-Way Sander. Orbital action for fast sanding . . . straight line action for finest finishing! Big 4½" x 9" sanding pad (Model 692).

NEW IDEA—3-Way Hammer. Hammers, drills, does both simultaneously for fastest masonry drilling at lowest cost per hole (Model 726).

NEW IDEA—Low Cost Air Buffer and Grinder. Uses super-tough tungsten carbide rasps, rods. Complete kit—Model 412—$135.00.



NEW IDEA—Improved 2-Speed All-Purpose Saw. High speed cuts wood, plastic, compositions; low speed cuts metals (Model 700).

NEW IDEA—Lowest Cost Power Screwdrivers. For light to heavy duty production. Skil Model 139 sells for $45.00, reversing model 140—$53.00!

Ask your Skil distributor for demonstrations. Look under "Tools-Electric" in the Yellow Pages. Or write for 68-page catalog: Skil Corporation, 5033 Elston Avenue, Chicago 30, Ill., Dept. 120L

Circle 527 on postcard, page 33

SKIL POWER TOOLS

How Wheeling Steel bought safety... gained efficiency with Cellulube 300

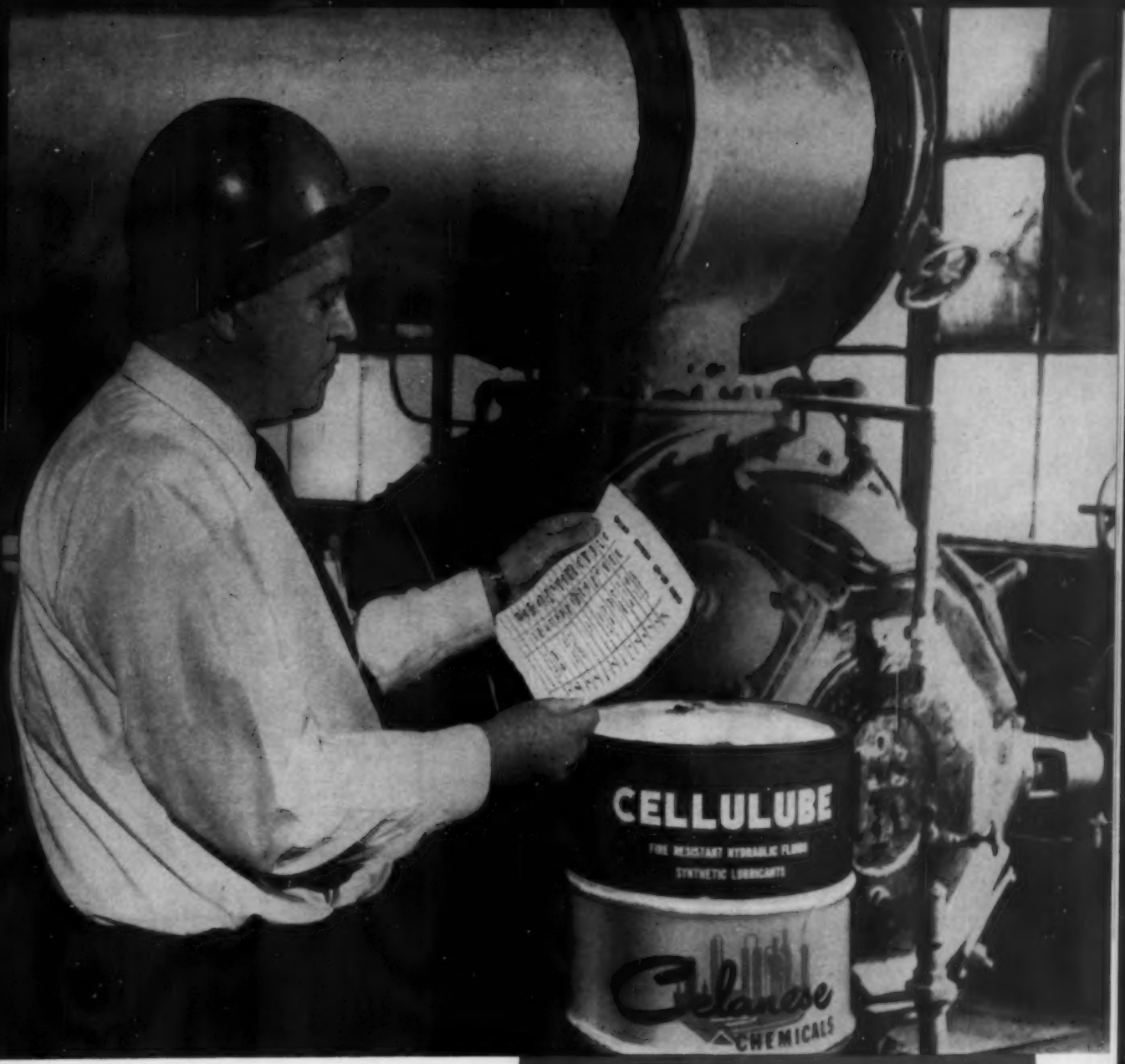
Mr. Kenneth N. Bundy, Superintendent of Utilities Department, Steubenville Works, Wheeling Steel Corporation is responsible for the safe and efficient operation of power house equipment. Air compressor lubricant is fire-resistant Cellulube 300.

Two of three 100 psi. air compressors in power house at Wheeling Steel. Not a single air-compressor fire has occurred at this installation since Celanese fire-resistant Cellulube 300 has been used as the lubricant.

Compressor fires were troublesome before Celanese Cellulube was used in three dual stage, 100 psi. air compressors in the power house of Wheeling Steel's Steubenville Works.

To stop this fire problem, Celanese recommended Cellulube 300. And, since use of this fire-resistant fluid was initiated more than five years ago, there has not been a single fire in any of the compressors! What's more, substantial savings have been gained through reduction in maintenance.

Celanese Cellulubes, available in six controlled viscosities, prevent build-up of hard car-



bon deposits. Cleaner operation eliminates the need for cleaning compressor auxiliaries and greatly reduces frequency of valve cleaning.

Cellulubes give overall protection against wear comparable to that of premium petroleum oils.

Doesn't it make sense to investigate what fire-resistant Cellulubes can do for you in terms of both safety and efficiency? The coupon will bring you complete details. Celanese Chemical Company, 522 Fifth Avenue, New York 36, N. Y.

Celanese® Cellulube®

Celanese Chemical Company is a Division of Celanese Corporation of America
Canadian Affiliate: Canadian Chemical Company Limited, Montreal, Toronto, Vancouver
Export Sales: Amcel Co. Inc., and Pan Amcel Co., Inc., 522 Fifth Avenue, New York 36

Celanese
CHEMICAL COMPANY

CELANESE CHEMICAL COMPANY
Dept. 585-L, 522 Fifth Avenue, New York 36, N. Y.

Rush data on Cellulubes.

Name_____

Company_____

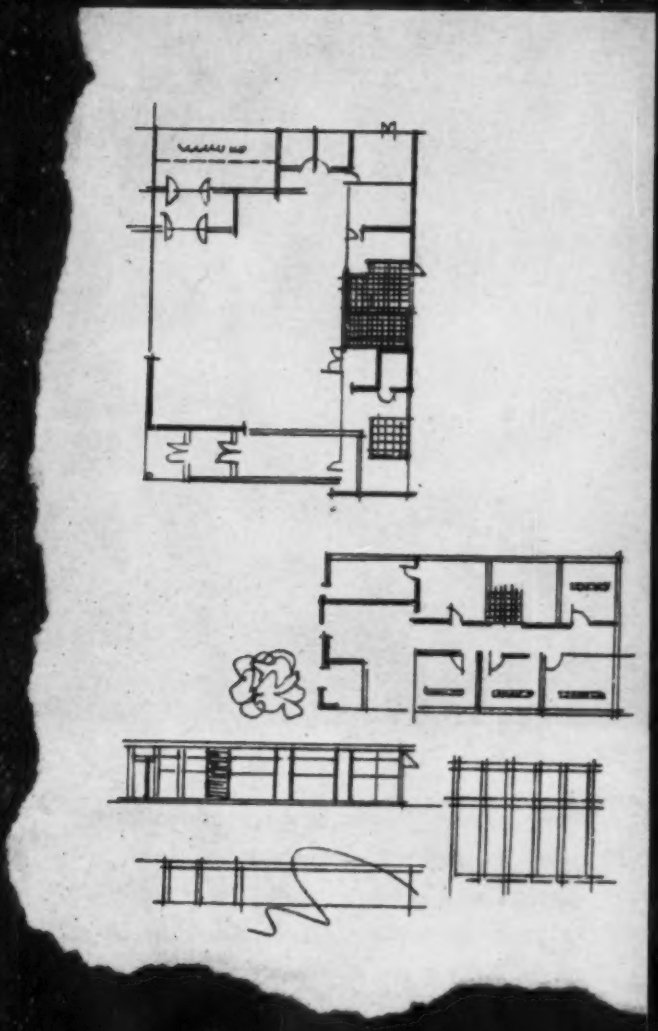
Address_____

City_____ Zone_____ State_____

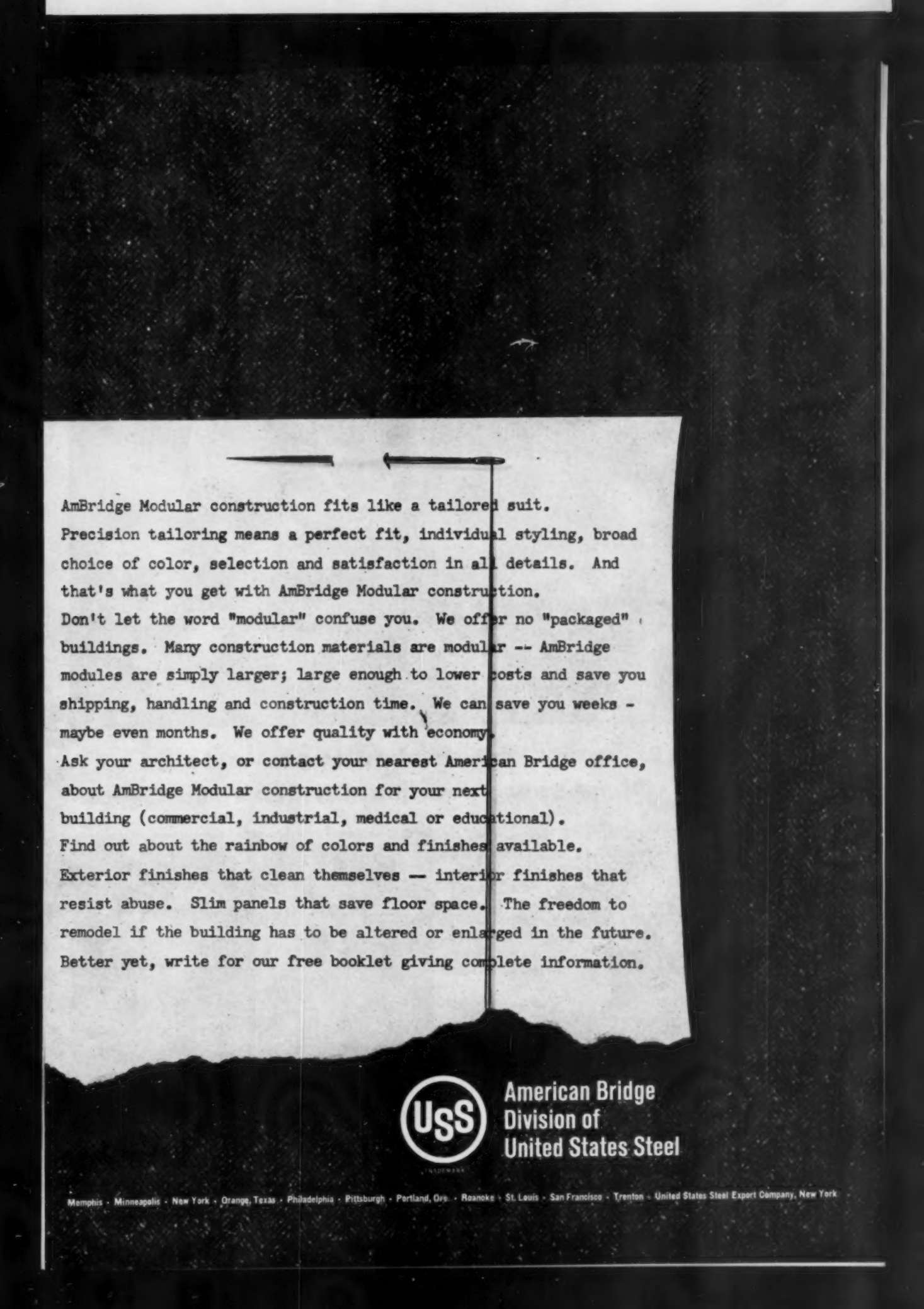
My application for Cellulubes is_____

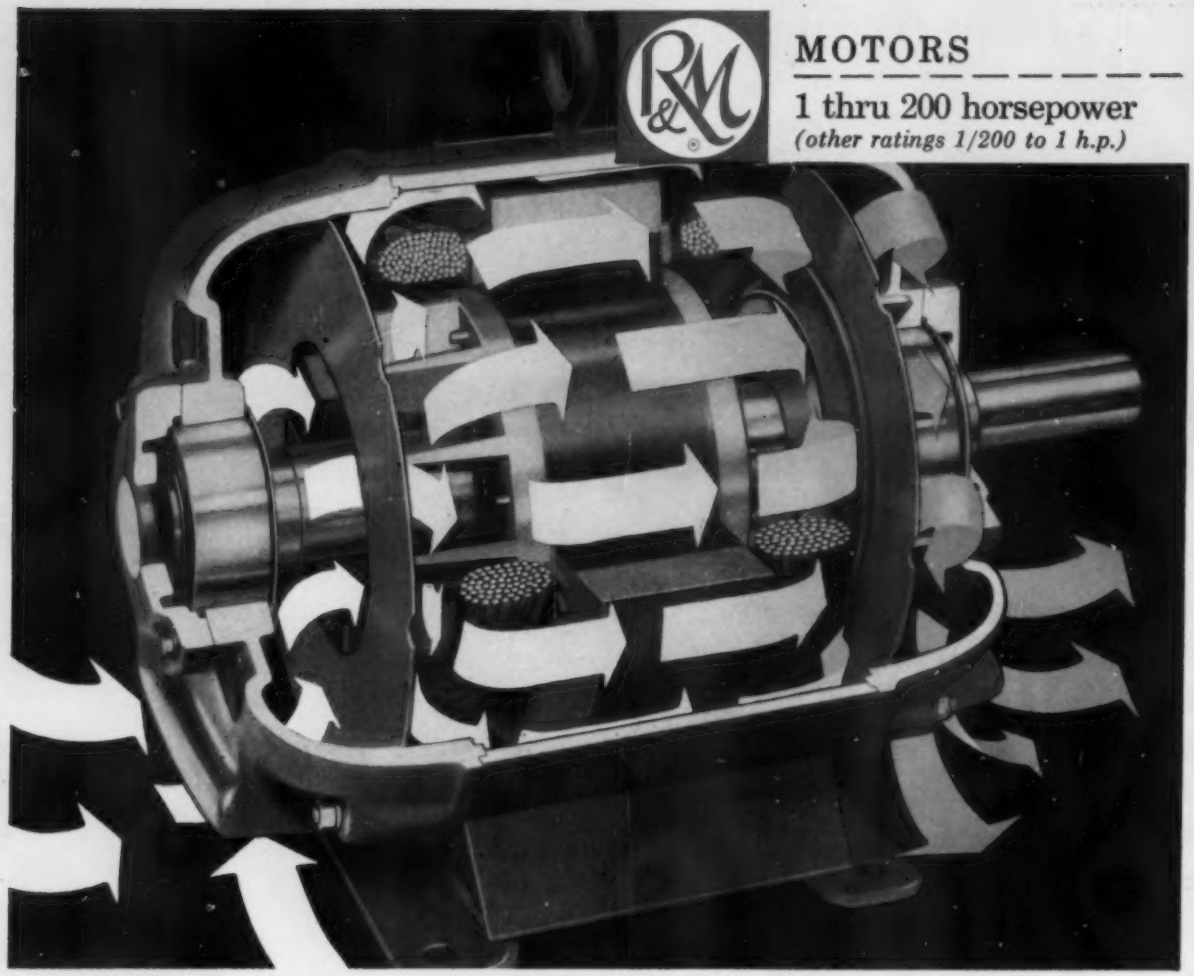
_____

Circle 528 on postcard, page 33



General Offices: 525 William Penn Place, Pittsburgh, Pa.
Contracting Offices in: Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Elmira • Gary • Harrisburg, Pa. • Houston • Los Angeles


AmBridge Modular construction fits like a tailored suit.
Precision tailoring means a perfect fit, individual styling, broad choice of color, selection and satisfaction in all details. And that's what you get with AmBridge Modular construction.
Don't let the word "modular" confuse you. We offer no "packaged" buildings. Many construction materials are modular -- AmBridge modules are simply larger; large enough to lower costs and save you shipping, handling and construction time. We can save you weeks - maybe even months. We offer quality with economy.
Ask your architect, or contact your nearest American Bridge office, about AmBridge Modular construction for your next building (commercial, industrial, medical or educational).
Find out about the rainbow of colors and finishes available. Exterior finishes that clean themselves -- interior finishes that resist abuse. Slim panels that save floor space. The freedom to remodel if the building has to be altered or enlarged in the future.
Better yet, write for our free booklet giving complete information.
USS
American Bridge
Division of
United States Steel
Memphis · Minneapolis · New York · Orange, Texas · Philadelphia · Pittsburgh · Portland, Ore. · Roanoke · St. Louis · San Francisco · Trenton · United States Steel Export Company, New York



MOTORS

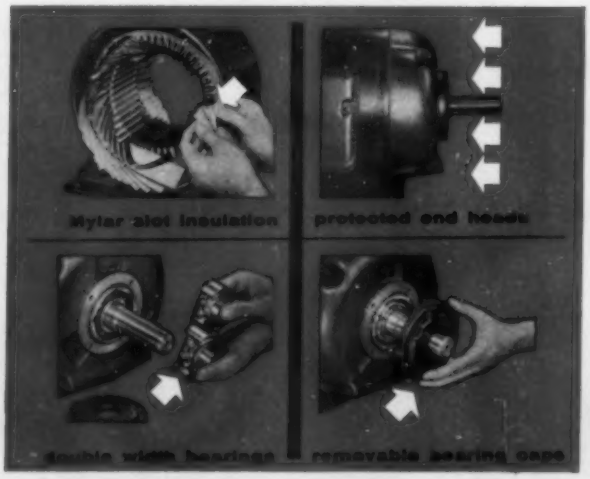
1 thru 200 horsepower
(other ratings 1/200 to 1 h.p.)

Longer Life because High Velocity *"Dual-Sweep"* ventilation *Cools and Cleans!*

ROBBINS & MYERS "Dual-Sweep" ventilation is a new concept in high velocity internal cooling and cleaning, designed to greatly prolong motor life. Tandem fans—one pushing, one pulling—create end-to-end ventilation that eliminates "dead" areas and converging air currents which deposit dirt. Venturi baffles at each end of the motor direct air in a washing action over and around end coils where it's most needed. Passages between field and outer shell form a "cylinder of air" which carries off motor heat.

R&M motors' long-life insurance also includes these features: Mylar* insulation that has 8 times the dielectric strength and 35 times more moisture resistance than ordinary paper insulation . . . double width bearings with extra-large grease capacity . . . end heads that offer full height protection . . . removable caps for quick bearing inspection and re-lubrication. For details, write today for Bulletin 520-PE.

**DuPont registered trademark*



ROBBINS & MYERS, INC.

motors, household fans, Propellair industrial fans, hoists, Moyno industrial pumps

SPRINGFIELD, OHIO • BRANTFORD, ONTARIO

Circle 530 on postcard, page 33

← Circle 529 on postcard, page 33

MOYNO® PUMPS

progressing cavities pump
suspended solids, corrosives
and abrasive slurries

MOYNO® PUMPS *turn problems into profits . . .*

Many materials, once considered "unpumpable," are now successfully handled by Moyno Pumps. Moynos have increased production and greatly lowered downtime on many jobs where they replaced rotary, centrifugal or piston type pumps which had run up prohibitive maintenance costs or failed completely. Moynos use a single moving pumping element . . . have no pistons, valves, high-speed impellers or other quick-wearing parts. The wide range of specially-resistant materials in which Moyno pumping elements are available assures exact jc b-tailored design for economical handling without excessive pump wear.

Moyno's unique "progressing cavities" move thin watery slurries, non-pourable abrasives, gnawing corrosives or suspended solids up to 1⅛" dia. The pump provides positive displacement . . . delivers uniform discharge without pulsation, agitation or turbulence. Moynos are available in many sizes, in capacities from 1/100 to 500 GPM and pressures up to 1000 PSI. Write today for new Bulletin 100-PE

typical problem materials
successfully handled by a MOYNO . . .

Acetates	Concrete Slurry	Paints
Acetic Acid	Copper Nitrate	Paper Pulp
Acid Mine Water	Creosote	Pickling Acids
Alcohol	Cutting Oil	Printing Inks
Alum (paper mill)	Cyanide of Potassium	Prunes
Aluminum Sulphate	Drilling Mud	Resin Plastic
Aromatic Hydro-carbons	Ferrous Sulphate	Salt Brine 3% to 30%
Asphalt	Fuel Oils	Sewage
Barium Sulphate	Fuming Sulphuric Acid	Shellac
Bichloride of Mercury	Gasoline	Shrimp
Boiler Feed Water	Glue	Soda
Bordeaux Mixture	Hydrochloric Acid	Starch
Carbon Dioxide	Impregnating Compound	Sugar
Carbonic Acid	Lacquers	Sulfurous Acid
Calcium Chloride	Lard	Tar
Caustic Soda (lye)	Latex	Turpentine
Cement	Match Head Compound	Varnish
Citric Acid	Molasses	Vinegar
Clay Slurry	Nickel Sulphate	Wood Pulp
Coffee Grounds	Nitric Acid	Yeast

ROBBINS & MYERS, INC., Springfield, Ohio

Moyno® Industrial Pumps • Fractional and Integral HP Electric Motors • Electric Hoists and Overhead Traveling Cranes
Propellair® Industrial Fans • R & M-Hunter Fans and Electric Heat • Trade-Wind Range Hoods and Ventilators
Subsidiary companies at: Memphis, Tenn., Pico Rivera, Calif., Brantford, Ontario.

Circle 531 on postcard, page 33

HOUGHTON HYDRAULIC FLUIDS and PACKINGS

Here are tips to help you achieve packing-fluid compatibility!

The efficiency, safety and ultimate cost of a hydraulic system is largely dependent on the compatibility of its packings and fluid medium . . . how well they do or do not work together.

Mineral Oils

The above is frequently overlooked when a plant switches from one type of fluid to another. Take *mineral oils*, for example. Three general types are used in hydraulics, and are classified according to their aniline points: high, medium and low.

If, through error, a high aniline oil is used where low aniline oils are specified, rubber seals in the system would shrink and harden. Conversely, "high aniline" rubber seals will swell and soften in low aniline hydraulic oils. Leakage or equipment failure is the result.

To complicate the picture further, mineral oils made to the same specification by different oil manufacturers, using different crudes, will vary in aniline point to the degree that they may cause synthetic rubber seals to either shrink or swell.

Even among the various types of synthetic rubber used for hydraulic seals, the reactions to mineral oils vary. Buna S and Butyl seals, for example, will disintegrate in mineral oil while Buna N, Neoprene, Viton and Thiokol polymers work very well.

Fire-Resistant Fluids

In many hydraulic systems, *mineral oils* are being replaced by modern, synthetic fluids which eliminate fire hazards without affecting hydraulic efficiency.

Three types of fire-resistant fluids are in wide usage and each type requires a *compatible* packing.

The three basic types of synthetic fluids with *recommended* and *maximum recommended* operating temperatures are shown in the box.

Type	Recommended Temperature	Maximum Recommended Temperature
Phosphate Ester	+130°F.	+180°F.
Water-Glycol	120°	150°
Emulsion water-oil	120°	150°

Phosphate Ester fluids and mineral oils have a directly opposite effect on the same rubber seals. Butyl packings which fail miserably in mineral oils, work beautifully with straight Phosphate Ester while Buna N, which works well in mineral oils, is unsuitable for Phosphate Ester. For this reason, changing a system from mineral oil to Phosphate Ester requires a complete and careful flushing and cleaning *as well as a switch in packing materials*, if elastomer packings are used.

For use with these fluids, homogeneous packings should be of Butyl, fabricated packings of Butyl and duck or asbestos and leather packings should be either Wax or Thiokol impregnated.

Water-Glycol fluids are generally compatible with both Buna N and Butyl seals, and with duck or asbestos. However, they do attack leather fibers. Water-Glycols have a pH of 8.5 to 10.5 and leather fibers start to disintegrate at a pH over 8.0

Because of this pH condition, leather packings are not recommended for use with Water-Glycols. Homogeneous packings should be of Buna N and fabricated packings of either asbestos or duck and Buna N.

Emulsion type fluids react much the same as mineral oils do with rubber and leather. In homogeneous and fabricated packings, use Buna N; in leather, use a filler of wax or Thiokol. Never use Emulsion fluids with Butyl.

A Simple Solution

As complex as the subject appears, packing-fluid compatibility in hydraulic systems can be determined with very little trouble. Houghton Packing-Fluid Compatibility Tables will instantly tell you which packings work best with the various types of fluids in general use.

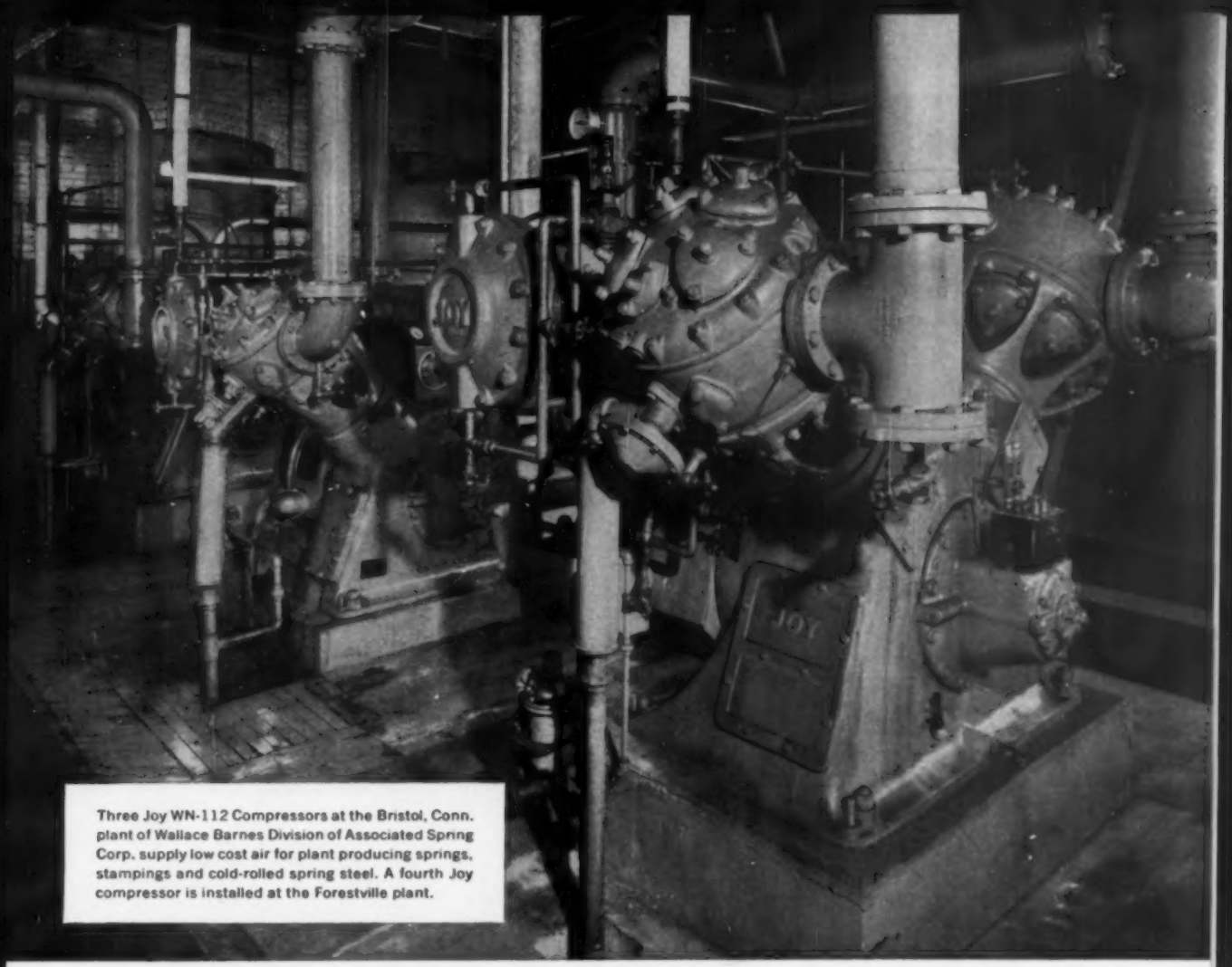
Better yet, Houghton is in a unique position to give you completely unbiased answers to your hydraulic packing-fluid problems, for **Houghton is the only manufacturer who offers you a complete line of both packings and fluids for industrial hydraulic systems.**

For your copy of Houghton's Packing-Fluid Compatibility Table, or for help on any hydraulic packing or fluid problem, call your Houghton representative or write: E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

Houghton

INDUSTRY'S PARTNER IN PRODUCTION

Circle 532 on postcard, page 33



Three Joy WN-112 Compressors at the Bristol, Conn. plant of Wallace Barnes Division of Associated Spring Corp. supply low cost air for plant producing springs, stampings and cold-rolled spring steel. A fourth Joy compressor is installed at the Forestville plant.

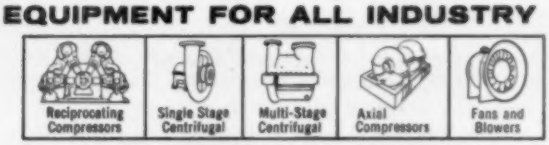
Four JOY Compressors in service a total of 54 years at Wallace Barnes—only $1161 in repair parts and service

Four Joy WN-112 Compressors at Wallace Barnes Division of Associated Spring Corp. have a remarkable service record, which has resulted in extremely low cost plant air. The four machines have a total of 54 years in service, in a three shift operation, yet repair parts and labor have totaled only $1161. According to the operator, maintenance amounts to changing the oil periodically and occasionally replacing a valve part. Total capacity of the compressors is 3500 cfm.

Performance like this is remarkable, even for Joy compressors, and depends upon adequate care of the machines. However, you can count on low maintenance and a high degree of reliability from any of the Joy compressors.

Consult your Joy representative whenever you want low cost air. Reciprocating Compressors in both standard and oil-free construction are available from 15 to 1250 hp; Centrifugals and Axial Compressors from 15 to 15,000 hp. For complete details on the Joy WN-112's, write for Bulletin 3205-15.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY



JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

Circle 533 on postcard, page 33

PLANT ENGINEERS' DIGEST®—so those who rush may read and know what's new

Edited by Bea Berghorn

Epoxy Seal Keeps Meters Dry

KEEPING underground meters in good working condition was a problem faced by the Columbia Water System, Columbia, Tenn. Leaktight seals were necessary to avoid seepage into the meters between the glass and the bonnet.

By using an aluminum-filled epoxy cement, Metalset A4, applied around the outside edge of each meter glass and cured by moderate heat for 30 to 45 minutes, the meters are now kept dry and in perfect working condition. *From a release of Smooth-On Mfg. Co., Jersey City, N. J.*

Airtight Bag Assures Good Welds

DEVELOPED for the Pratt and Whitney Aircraft Corp., an airtight multi-opening vinyl bag is used for welding high temperature metals in inert gas. The chamber is used for welding inlet guides on a jet fan engine.

The part to be welded is placed within the vinyl welding bag, which can be made to any size or shape, and the air removed by the purge or vacuum method. Inert gas is then pumped into the bag preparatory to welding.

Plastic welding chamber being used for welding inlet guides on fan engine.

Inserting his hands through sleeves to which rubber gloves have been attached the weldor then proceeds with the welding operation. When the welding is finished, gas is withdrawn and the bag removed.

This method assures a higher percentage of acceptable welds to meet government standards. *From a release of Pioneer Valley Plastics Co., Agawam, Mass.*

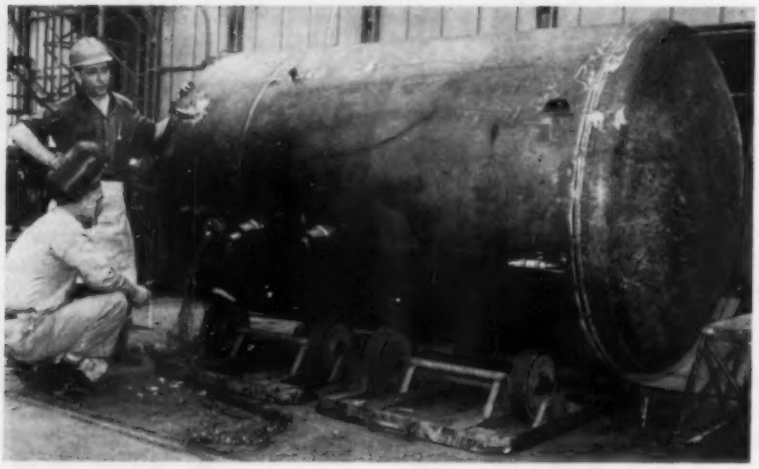
Bearings Check Abrasion

HIGH maintenance on foundry equipment, caused by abrasion, is being reduced by use of urethane rubber bearings.

At the Auto Specialties Mfg. Co., St. Joseph, Michigan, a large portion of their business is casting malleable iron parts. Sand molds are loaded in a blow-squeeze machine that facilitates high speed production. To keep up with the rapid mold filling machine, a coring conveyor line is used to deliver the open molds to the automatic mold closing machine. Cores are then set in mold before closure.

The abrasion problem was with the conveyor bearings. Sand, used for molds, sifts into every mechanism and grinds away at moving parts. Each week many ball bearings had to be replaced due to sand abrasion and nearly continuous maintenance was necessary to keep the conveyor running. To correct this problem, sleeve bearings made of Adiprene urethane rubber were installed on the conveyor line. *From Elastomers Notebook published by Elastomers Chemicals Dept., E. I. du Pont de Nemours and Co., Wilmington, Del.*

Hard Job Made Easy by Trying Something Different



By ingeniously inverting two rubber-wheeled dollies and placing a steel tank on the wheels, F. S. Ring (standing), experimental engineering jig and weld shop, Lockheed Aircraft Corp., Marietta, Ga., found a hard job could be done the easy way. The tank can now be easily and conveniently turned for fabrication, welding and assembly. (From Lockheed Southern Star, published by The Lockheed Aircraft Corporation, Marietta, Georgia)

Gate Keeping by TV

BY INSTALLING a closed circuit television at a remote plant gate, Merck and Co., Inc., Rahway, N. J., has solved one of the most troublesome jobs in any industrial plant, that of plant protection in remote areas.

Located half a mile away from the main entrance, the gate was nevertheless convenient for employees to use during nighttime hours, weekends and holidays.

The system installed consisted of a TV camera with controls adapted for remote control and mounted in a weatherproof enclosure, as well as receiving monitor, communication equipment, motor to open the gate automatically by remote control and control equipment to operate the net-

CROUSE-HINDS

New Mark 9 CONDULET®

CONDUIT FITTINGS

Tough, thin die-cast walls and a new cover-opening design afford maximum space for easy, efficient wiring. No sharp edges to endanger hands or insulation in installation. Wiring is always readily accessible for repairs or alterations.

Feature for feature, the new Mark 9 line in copper-free, corrosion-resistant aluminum offers greater ease and economy in installation, plus dependable protection in an unusually wide range of types, sizes, and wiring devices. Write for Bulletin #2730 for information on Mark 9 and other Crouse-Hinds copper-free aluminum products. Or see your Crouse-Hinds distributor.

CROUSE HINDS

REG. U.S. PAT. OFF.

MAIN OFFICE: SYRACUSE, N.Y. **FIELD OFFICES:** Albany, Atlanta, Baton Rouge, Birmingham, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Corpus Christi, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Oregon, St. Louis, St. Paul, Salt Lake City, San Francisco, Seattle, Tampa, Tulsa, Washington. **RESIDENT REPRESENTATIVES:** Baltimore, Md., Meriden, Conn., Reading, Pa., Richmond, Va., Springfield, Mass. **FOREIGN AFFILIATES:** Crouse-Hinds Company of Canada, Ltd., Scarborough, Ont., Crouse-Hinds-Domex, S. A. de C. V. Mexico, D. F. **MANUFACTURING LICENSEE:** Peterco, Sao Paulo, Brazil

Circle 534 on postcard, page 33

No. 12 in a series of washroom survey comments from "SBS soap counselors"

We showed them how to remove tough soils the easy way!

Waring G. Houston

SBS Soap Counselor, reports how he aided a rubber manufacturing plant in solving a specific soil problem:

"This company has always had a tough time keeping its washrooms clean because of the presence of rubber dust, latex, cements, special inks and other hard-to-remove soils. Maintenance men resorted to special-purpose cleaners to cope with the problem. In a short time, the cost of labor and cleaning materials went sky high!

"We pointed out, of course, how much easier they could do the total cleaning job with SBS-50 Cleaner-Disinfectant-Sanitizer-Deodorant. We demonstrated SBS-50's effectiveness against every tough soil found in their washrooms. They were amazed to find out how easily they could end the costly duplication of manpower and materials!"

Money-saving suggestions like this *begin* with OPERATION PINPOINT–a thought-provoking presentation filled with facts about skin hygiene and washroom maintenance. The SBS soap counselor serving your area can pinpoint the right soap to do every skin cleansing job best and at lowest cost in your plant. Let him show you OPERATION PINPOINT . . . just call your nearest SBS office, collect.

the washword of industry

SBS sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N.J.
CANADA: Chemical By-Products, Ltd., Toronto, Ontario

Circle 535 on postcard, page 33

PLANT ENGINEERS' DIGEST

(Digest begins on page 48)

Although located half a mile away, the guard can monitor the remote gate by use of electronic gatekeeper.

work. The viewed area is illuminated.

The guards on around-the-clock duty at the main plant entrance can monitor the remote gate and identify employees entering or leaving the plant, without leaving their post. *From a release of Dage Div., Thompson Ramo Wooldridge Inc., Michigan City, Ind.*

Material Handling Simplified

Costs were reduced and time saved in setting up a new warehouse by installing a "one-man" handling and truck loading system in the Versabar Corp., Jersey City, N. J.

Products to be handled were rolled steel channels, 20 ft long, part of a light structural framing system, together with fittings and hardware. With the new installation one man is now able to pick up a bundle of any of the different types of channels from the rack and deposit it directly into a truck without rehandling.

The equipment consists of an L-shaped monorail system, with one leg fixed and the other leg free to swing in a horizontal plane. The swing section is supported by a trolley which rolls on a curved rail. This permits the swing section to cover an arc of approximately 150 deg.

The channel inventory is arranged

SELECTION CHART for triple-tested Moline Chains*

Here is a quick, easy reference chart for comparing the seven most popular Moline Chains. Are you familiar with all the attachments available... the range of sizes... and all their applications? This chart will help you compare their size, capacity range and various uses. It's a part of the new, illustrated "Moline Conveyor Chain Manual and Design Engineers' Handbook" which is available now to help you specify the right chain for your requirements. Write today for your copy.

	CHAIN TYPE & NUMBER	APPLICATION AND INSTALLATION	ATTACHMENTS	PITCH RANGE IN INCHES	ULTIMATE STRENGTH IN LBS.
	Detachable Chains—25, 32, 33, 34, 42, 45, 50, 51, S-51, 52, 55, 57, 62, 67, 75, 77, 78, 88, 95, 103, 108, 114, 124	Widely used throughout industry, conform to "manufacturers' standard" and available in a wide variety of sizes. Many attachments make this type versatile and adaptable to any light to medium-duty conveyor service.	A-1-2-3-12-110 C-1-5-8-15 D-3-4-5 E-1 F-2-8-16 K-1-2-3-5-40-73-345 H-1-2 K-1-2-3-5-40 L-2 M-1-3 R-1-2 S-1 Scraper 1-29	.902 to 4.063	700 to 17,000
	Pintle Chains 400 class. Light weight Pintle. 700 class.	Serviceable, long-wearing, moderately-priced chain for general elevating, conveying and power transmission service for drives at low and intermediate speeds with moderate loads. In "400" lightweight and "700" class types.	A-1-12-115 D-5 E-1 F-2-5-16 G-1-6-19 K-1-2 M-1 F-2-5 F-22-6" F-2-22-8" A-2-42 K-1-2-720-A-2-730 720-M-1 M-1-2	1.375 to 4.720	4,200 to 22,000
	H-Type Mill H-60, H-62, H-74, H-75, H-78, H-82, H-85, H-87, H-95, H-124	Designed primarily for heavy drives and transfer conveyors in saw mills and pulp and paper mills but widely used throughout industry. Strong and rugged, provided with wearing shoes for stiffness and long service life.	A-1-12 F-4 G-1-6-19-48 H-1-2 K-1-2 M-3 R & L RR	1.654 to 4.000	7,000 to 30,000
	Combination Type Mill Chain 6104, 6110, 8116, 8480	Designed for the same applications as regular H-type conveyor chains and refuse chains but has larger diameter rivet, greater ultimate strength for more rugged duty in general drag conveyor service applications.		6.00 to 8.00	42,000 to 56,000
	Combination Chains—C-55, C-77, C-102B, C-102½, C-110, C-110-C, C-111, C-111-C, C-131, C-131-C, C-132, C-132-C, PW-132, C-188, MW-188	Very rugged and serviceable for use in bucket, transfer and many other types of conveyors. Widely used in cement, chemical, lumber, quarrying, mining industries. Available in pin and cotter assembly or riveted construction.	C-3-132 RF-12 F-2 G-6-19 K-1-2-3 LL-25	1.631 to 6.050	9,000 to 50,000
	Dairy Conveyor MC-33	Extensively used in dairy and bottling industries, designed for both horizontal and lateral turning. Detachable construction, interchangeable with manufacturers' standard 4250, available only in extra strength Promal.		2.500 only	12,000
	Ley bushed Chain—823, 825, 830, 844	Developed for hard, rugged service under extremely abrasive and other adverse conditions. Used extensively in conveying or elevating sand, gravel, cement and in similar industries where service demands are rigid.	K-2 F-2	4.00 to 6.00	19,000 to 40,000

Write today for your free copy of the Moline Conveyor Chain Manual and Design Engineers' Handbook.

*Call your nearby Moline dealer today for help on your chain problem. Complete design service available for special chains or unusual applications.

Leaders for 60 years

Moline Chains

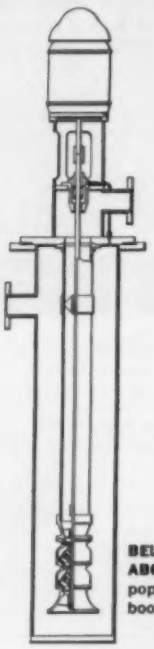
MOLINE MALLEABLE IRON CO., St. Charles, Illinois

Specializing in the manufacture of chains

Circle 536 on postcard, page 33

Examples of Johnston Versatility:

STANDARD UNIT— Designed to pump from underground storage tanks.



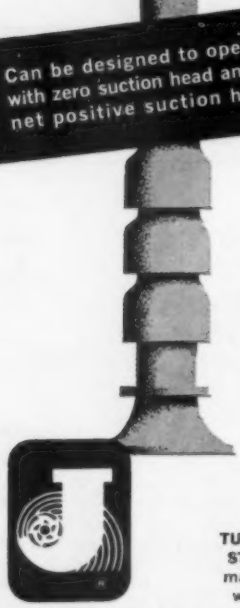
SUCTION AND DISCHARGE ABOVE GRADE— perfect process or in-line pump.

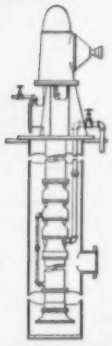
BELOW-GRADE SUCTION— ABOVE-GRADE DISCHARGE— popular for line booster service.

VERSATILE VERTICALS BY JOHNSTON FOR VOLATILE FLUIDS

GASOLINE - CRUDE OIL - AMMONIA - L-P GASES
PIPE LINES - REFINERIES - AIRPORTS

Can be designed to operate with zero suction head and/or net positive suction head.





COMBINATION TURBINE-PROPELLER STRIPPING PUMP— maximum suction lift without vapor lock.

WET PIT BOOSTER, TRANSFER OR CIRCULATING PUMP— no expensive priming device necessary.

DIRECT DISPENSING— For transfer of volatile liquids and chemicals.

UNLIMITED FLEXIBILITY—Johnstons fit any piping layout—satisfy virtually all pumping requirements.

CHECK THESE OTHER FEATURES: Economy of higher speeds; Non-overloading power characteristics; Steep head-capacity stability.

For complete details and typical applications, write for colorful bulletin.

Versatile Verticals by

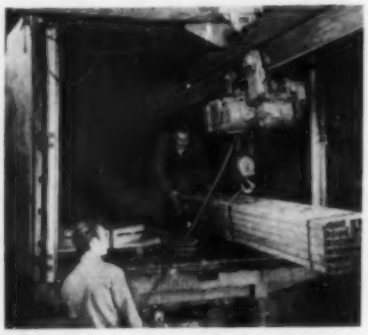
JOHNSTON PUMP COMPANY
3272 E. Foothill Blvd., Pasadena, California

Circle 537 on postcard, page 33

PLANT ENGINEERS' DIGEST

(Digest begins on page 48)

Bundle is easily picked from rack.



Inside truck, boom spots the bundle.

in two rows. The rear row is covered by the fixed leg of the monorail, the front row by the swing section. When a truck backs in, the projection of the swing section reaches into the body of the truck and permits bundles of channel or boxes of fittings to be deposited directly into the truck. The lateral swing of the projection makes it easy to spot the bundle at any point. The equipment can also be used for unloading incoming material. *From a release of M-H Standard Corp., Jersey City, N. J.*

Ultrasonics Clean Damaged Parts

WHEN a nearby fire caused heavy smoke damage to intricate boat components the Falcon Alarm Co., Inc., Summit, N. J., restored the parts to their original condition by the use of ultrasonic cleaning.

The cleaning equipment consisted of a Sonogen generator, a 5-gal tank with transducers fastened to the bottom and a parts basket, slightly smaller than the tank.

After filling the tank with solvent at 120 to 160 F, depending upon the

Before-and-after comparison shows how ultrasonics cleaned boat horn.

size of the load and type of solvent, the parts to be cleaned were placed inside. Smaller parts were loaded into the basket which was immersed in the tank.

In a matter of seconds the transducers in the tank converted the electrical oscillations into mechanical vibrations and transmitted them into the cleaning medium. The components were then removed, thoroughly cleaned. After being rinsed with water they were given a final alcohol rinse and no hand scrubbing or further treatment was necessary. *From a release of Branson Instruments, Inc., Stamford, Conn.*

Security Guard Checklist

EMERGENCY information will vary from plant to plant, depending on the facility, its equipment and its relationship to the community and outside services.

Here's a basic checklist that should apply to most security installations, and that most security guards should know:

- How to call the local fire and police departments and other sources of help.
- Location of hydrants, stand-pipes, small hose and extinguishers.
- The layout of the area he is to protect, including all buildings and occupancies, yard areas, entrances, roadways, stairways, elevator shafts, and other features of the premises.
- Whether alarms are only internal or are connected directly to the fire department.
- Locations of all regular telephones; switchboard operations.
- How to start and operate fire pumps.
- Proper pressure on the regular sprinkler-system gage.

(Continued on next page)

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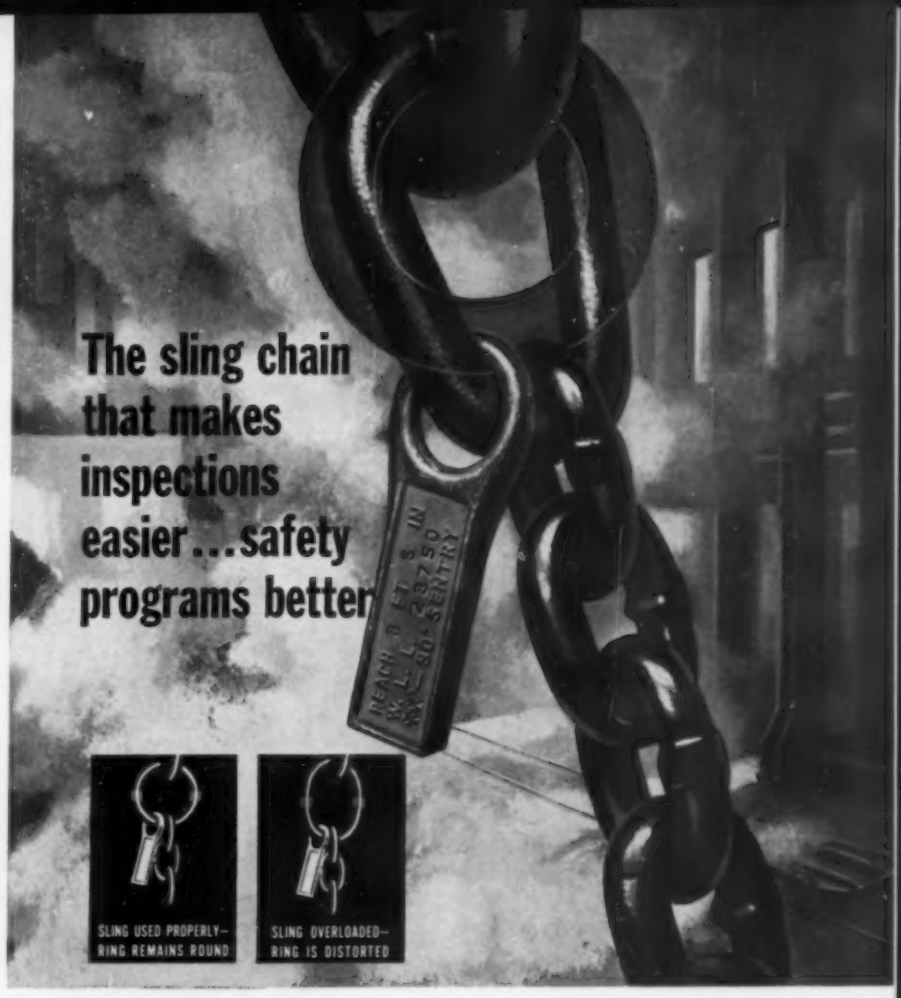

The sling chain that makes inspections easier...safety programs better
SLING USED PROPERLY—RING REMAINS ROUND
SLING OVERLOADED—RING IS DISTORTED

CAMPBELL SENTRY® SLINGS

The revolutionary Warning Ring* acts as a joiner link on Campbell's new Sentry Sling. It is stronger than the chain itself yet elongates measurably and visibly when the chain has been overloaded . . . before the sling is damaged by the overload. It's a plus factor in recommended inspection procedures. This means easier-than-ever inspections, lower-than-ever repair costs, better-than-ever sling safety programs.

Sentry Slings, available in all types, are made from Cam-Alloy steel chain only. All carry the Campbell Guarantee and Certificate of Test —and can be re-tested and re-certified for service.

SENTRY SLING CHECK GAUGE

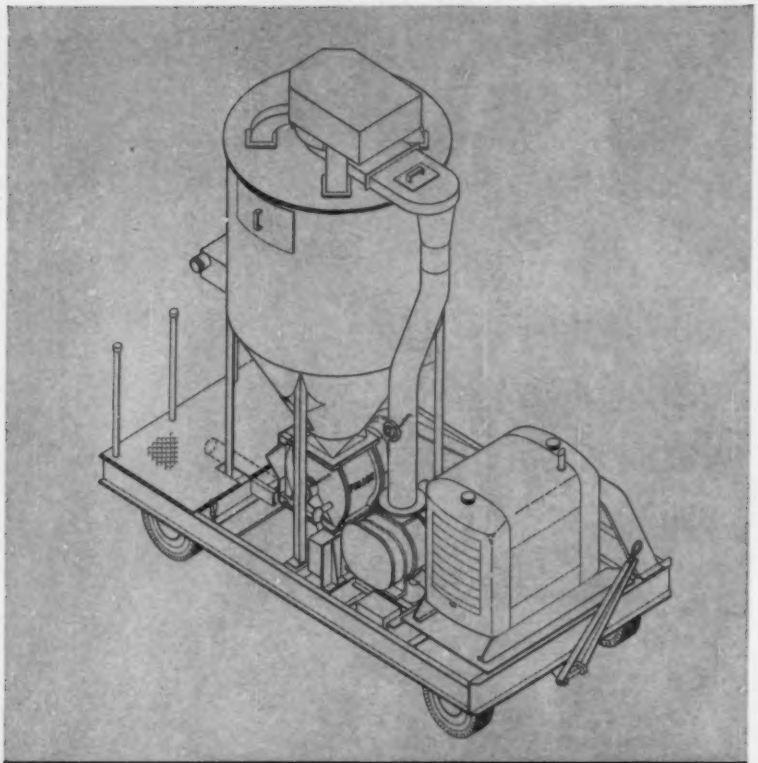
The check gauge makes it easy to measurably determine the first signs of overload. When the gauge turns freely after being inserted in the Warning Ring, you know elongation has *not* taken place. If it will not turn, remove complete sling from service and return to nearest Campbell plant for repairs. Handle of Check Gauge measures elongation of individual links, as well.

*Pat. No. 2966878

Get information from your Campbell distributor, or write direct.

CAMPBELL CHAIN COMPANY

3 FACTORIES: York, Pa.; West Burlington, Iowa; Union City, Calif.
WAREHOUSES: Medford, Mass.; Atlanta, Ga.; Dallas, Texas; Chicago, Ill.; Portland, Ore.; Seattle, Wash.; Los Angeles, Calif.



Safe, clean, jam-safe transfer of dusty chemicals, grains and flours is now possible with the advanced filter design of this new pneumatic transfer unit.

Newest FULLER portable transfer unit handles dusty materials

Designed to handle a wide range of dusty materials such as plastics, chemicals, grains and flours, the newest Fuller Transfer Unit is a continuous filter type for dense stream pneumatic conveying.

Principal design feature of the new high capacity transfer unit is a newly developed, completely automatic filter. This unit is of extremely simple construction, its filter elements being cleaned continuously by a single master valve driven by a ⅛ hp. motor. The valve has only one moving part, the rotor, which is carried in two bearings, sealed for life.

Fuller Portable Airveyor Transfer Units are of the combination vacuum-pressure type, with the vacuum side picking up the material and the pressure side delivering it to the desired destination. Unit is available with power supply by either electric motor or gasoline engine (as shown here).

Low cost, rapid handling to and from cars, trucks, storage bins and silos is available for many granular and pulverized materials. Hook-ups are fast and the unit is quickly moved from one job to another. Materials movement is rated up to 20 tons hourly in 3" or 4" lines.

See Chemical Engineering Catalog for further details and specifications.

3140
A-295

FULLER COMPANY
138 Bridge St., Catasauqua, Pa.
Subsidiary of General American Transportation Corporation
Offices in Principal Cities Throughout the World

Fuller
...pioneers in harnessing AIR

Circle 539 on postcard, page 33

PLANT ENGINEERS' DIGEST

(Digest begins on page 48)

- Where all doors and fire exits are located.
- The locations of all fire-alarm boxes and telephones inside and outside the plant, and how to use them.
- Locations of valves controlling sprinkler systems, inside riser valves, post indicator valves, sectional valves, and drain valves.
- Exact locations of dangerous or extra hazardous machinery or material.
- How to use switches so as to control the power and lighting systems and how to shut off current in case of an emergency.
- How to give basic first aid.

From a release of Pinkerton's National Detective Agency, Inc., New York, N. Y.

Machine Mounts Cut Moving Costs

MACHINE mounts made of adjustable cast iron wedges, faced top and bottom with a pad of resilient material, saved an estimated $5000 when a specialty machine shop was recently moved to a new plant.

Instead of pouring concrete and bolt foundations, Walter W. Field and Son, Inc., Watertown, Mass., used the padded mounts which permitted machines to be set on the concrete floor and leveled without shimming, eliminating downtime on the machines as well as most vibration problems. *From a release of Air-Loc Div., Clark, Cutler and McDermott Co., Franklin, Mass.*

Workman adjusts the level of machine by turning bolt to correct position.

Circle 540 on postcard, page 33 ➔

"These ILG Ventilators save ceiling replacement"

. . . Ohio Falls, Inc., Louisville, Ky.

"Vapor in our dye plant was so thick *until we standardized on Ilg*," writes W. B. Willingham, president of Ohio Falls, Inc., Louisville, Ky. "It was *like walking through rain*."

"Building maintenance costs were terrific as we were constantly replacing ceilings, sills and flooring. Due to heavy moisture, we cannot use metal ducts . . . have to make them of either cypress or redwood.

"Since installing Ilg ventilators we have had no moisture or steam vapor loose in our plant. Building repair costs are at a minimum. Maintenance costs on Ilg equipment are even less. Fact is, there are *none*."

ILG®

ILG ELECTRIC VENTILATING CO.

2832 N. Pulaski Road, Chicago 41, Ill.
Offices in 60 Principal Cities
Member of Air Moving and Conditioning Association, Inc. (AMCA)

Here's why centrifugal and propeller roof ventilators satisfy so many

Finger Points at patented pressure cooling feature of Ilg L-CRF centrifugal roof ventilators exhausting fumes from research laboratory of The Mead Corporation, Chillicothe, Ohio. Ilg-built backward-curved aluminum airfoil fan wheel with patented backplate fins pulls cool air into motor compartment and through the motor to protect against build-up of heat from sun . . . *increases motor life expectancy up to four times that of ordinary units.* Fifteen sizes for capacities from 155 to 27,290 c.f.m. WRITE FOR CATALOG DB3-200.

Upblast Roof Ventilators with butterfly dampers provide high-speed, vertical exhaust. Airfoil-design propeller blades (in five sizes from 24" to 48") are direct-connected to Ilg-built totally enclosed motors. A choice of fourteen capacities from 5060 to 33,300 c.f.m. WRITE FOR CATALOG DB3-300.

Ilg L-LSQ Propeller Roof Ventilators have direct connected, patented "Q" fan wheels that pass air over blade smoothly, quietly. Low starting torque of Ilg 3-phase and permanent-split capacitor; single-phase motors eliminates starting shock, lengthens fan life. Eleven sizes to choose from for capacities from 287 to 21,100 c.f.m. WRITE FOR CATALOG DB3-100.

ILG ELECTRIC VENTILATING CO.

2832 N. Pulaski Road, Chicago 41, Ill.

Offices in 60 Principal Cities

Member of Air Moving and Conditioning Association, Inc. (AMCA)

What Really Happens Inside the Bucket

Exploding a widespread misconception of the operation of inverted bucket steam traps

In describing the operation of the inverted bucket trap many well meaning people—and some not so well meaning; i.e., competitors—refer to the need for a "bucket full of steam" to close the trap, and a "bucket full of condensate" to open the trap. The implications of these requirements are many. Sometimes they are contradictory. Often they are misleading. Observations of a trap with a glass body and a glass bucket plus trap design considerations tell the true story.

* * *

In a well designed inverted bucket trap (Armstrong, naturally) the bucket will float and close the valve when it is *no more than two-thirds full of steam.* For example, the bucket in an Armstrong No. 812 trap is $3^{15}/_{16}$" deep. It will float with only 2" of steam.

Good design also dictates that the maximum test opening pressure of a trap should be well in excess of the maximum working pressure for which the trap is furnished. For example a No. 812 trap for 100 psi with the bucket filled with cold water should open at a test pressure of at least 165 psi. Therefore, the bucket does not have to fill completely with condensate to open at 100 psi. The entrance of 1.20" of condensate will cause the bucket to sink. .8" of steam remains at the top of the bucket at the time it is heavy enough to open the valve at 100 psig and with no back pressure.

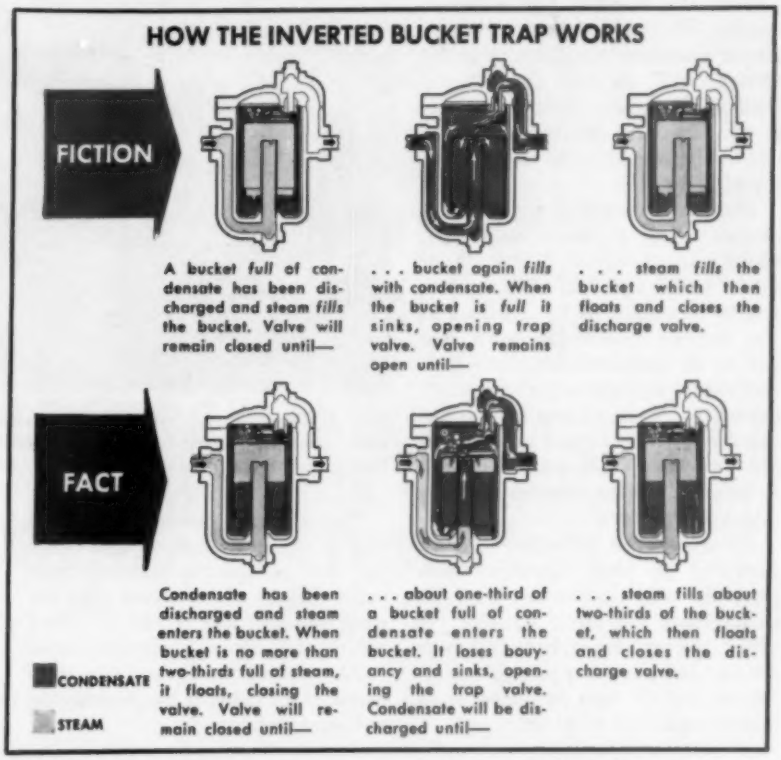
Thus the opening and closing of a 100 psi trap with $3^{15}/_{16}$" deep bucket is controlled by a change in the water level of only 1.20".

In actual practice the 100 psi trap may be draining a steam main in which daytime pressure is only 30 psig. Instead of requiring a 1.20" rise in bucket water level to open the trap against this pressure, the bucket will be heavy enough to open the valve as soon as the water level in the bucket has risen about $^{5}/_{16}$".

Obviously, it does not "take a bucket full of steam" to close the inverted bucket trap, or a "bucket full of condensate" to open the trap.

What's the Significance?

As illustrated above the opening of an Armstrong Trap requires the accumulation in the trap of less than one-third of a bucket full of condensate. This assures good operating characteristics for the vast majority of services by discharging small accumulations of condensate as soon as they reach the trap. It also assures frequent opening pressure drops to break up air and condensate films on heat transfer surfaces and thereby maintain high heat transfer rates in the unit being drained.


HOW THE INVERTED BUCKET TRAP WORKS
FICTION
A bucket full of condensate has been discharged and steam fills the bucket. Valve will remain closed until—
. . . bucket again fills with condensate. When the bucket is full it sinks, opening trap valve. Valve remains open until—
. . . steam fills the bucket which then floats and closes the discharge valve.
FACT
Condensate has been discharged and steam enters the bucket. When bucket is no more than two-thirds full of steam, it floats, closing the valve. Valve will remain closed until—
. . . about one-third of a bucket full of condensate enters the bucket. It loses bouyancy and sinks, opening the trap valve. Condensate will be discharged until—
. . . steam fills about two-thirds of the bucket, which then floats and closes the discharge valve.
CONDENSATE
STEAM

Additionally, the fact that no more than two-thirds of a bucket of steam is required to float the bucket means that there will always be a generous water seal at the bottom of the bucket. In the case of the No. 812 trap described above, it will be 1.8" deep. This insures that no steam can leak from the bottom of the bucket. More importantly, the bucket can float to close the valve even when the bucket is not completely submerged in condensate.

A Proven Principle Engineered Up to the Minute

While the inverted bucket concept for steam traps is half a century old, today's Armstrong inverted bucket traps incorporate design considerations unknown 50 years ago. The inverted bucket of the Armstrong trap, for example, is not just an upside down bucket. It is a carefully sized, weighted and vented component of a steam trap mechanism that experience proves will do its job right. Throughout, Armstrong design has kept pace with technological advancements, modified when necessary to meet changing requirements.

We do not claim that Armstrong Traps will do every single job better than any other trap. But we do believe it will do more jobs better and more consistently than any other trap. More important, though, for most services, Armstrong Inverted Bucket Steam Traps enable you to get more efficient steam utilization with minimum problems.

We're so sure of what Armstrong Traps can do that we unconditionally guarantee that they will satisfy you. You are the sole judge, too, so there's practically no risk.

* * *

The 48 page Armstrong Steam Trap Book describes other Armstrong features. It also discusses trap selection, installation and maintenance. Ask your Armstrong Representative for a copy or write: **Armstrong Machine Works, 9123 Maple Street, Three Rivers, Michigan.**

ARMSTRONG STEAM TRAPS

Circle 541 on postcard, page 33

OPERATION AND PRODUCTION—pointers for the industrial plant engineer

Edited by Ken Lawson

Bonding with Epoxy Replaces Welding for Tank Mixer Supports

OVER SIX MONTHS ago adhesive bonding was used for the first time to attach mixer support plates to an in-service crude oil feed tank at the Shell Oil Company, Martinez, California. To date, the steel plates are still firmly bonded to the tank despite a load of 1250 lb.

The plate anchoring problem developed when a mixer had to be added without delay to a five-million-gallon tank. One end of the mixer was to be supported by a flange on the manhole cover—the other end had to be supported from the tank wall firmly enough to prevent mixer movement. A ground support was unsuitable because it could cause excessive propeller shaft deflection with subsequent leakage, overheated packings and shaft wear.

By using Epon Adhesive 901/B-1, produced by Shell Chemical Company, the tank was restored to service in less than one day. To weld the plates, the tank would have had to be drained and purged, a process requiring at least six days downtime at an approximate cost of $2500.

Fig. 1. Steel anchor plate coated with a high strength epoxy adhesive is shown being positioned on an oil storage tank.

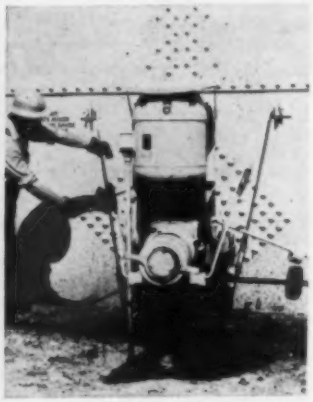


Fig. 2. The following day, J-bars were attached to the resin bonded plates and mixer frame.

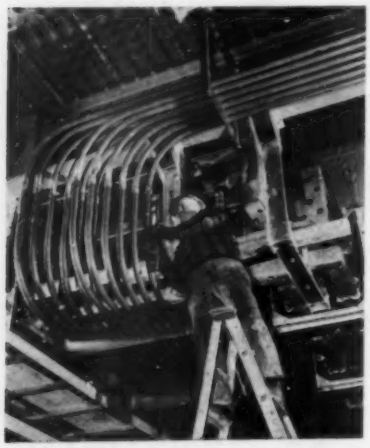
This adhesive bonds steel-to-steel with a tensile strength of over 2800 psi; it is resistant to moisture, sunlight, climatic changes and most organic liquids; and it can be cured overnight at normal air temperatures.

The mating metal surfaces were prepared for bonding by sandblasting to bright metal.

A 1/16-in. layer of adhesive was spread with a putty knife onto the plates and the tank. The plates then were pressed against the tank and a fillet was formed around the edges. They were supported until the adhesive had set the following day and was strong enough to take the full mixer load.

Conduit Precoded in Color

COLOR CODED CONDUIT is reportedly being given its most extensive use to date in the 80-in. hot strip mill at River Rouge, Michigan, for Great Lakes Steel Corporation, a division of National Steel Corporation.



The conduit run shown makes good use of a drilled plate hanger system.

Here all exposed conduit is a bright red color, to distinguish it from pipe being used for other purposes.

As much of the Sherarduct conduit was to be installed in high bay areas, 50 ft above the floor, or in tight clusters of runs supported in drilled plate hangers, painting it after installation would have been prohibitively costly.

This rigid steel conduit manufactured by the National Electric Division, H. K. Porter Company is galvanized, immersed in a bath of corrosion-resisting polyvinyl to which the color pigments have been added.

Maintenance with "Liquid Shim"

RESTORING THE FIT between replacement bearings and worn housings in electric motor end-bells is an expensive maintenance problem which has been simplified by the use of a plastic sealant.

One common method of repair is to bore out the housing to a larger diameter, press in a steel sleeve and then machine the sleeve ID to proper size to mount the new bearing with a tight fit. Another method involves metallizing the housing and then machining. This generally costs about the same as sleeving and usually takes more time if the parts must be sent out to have metallizing work done.

Loctite, a product of American Sealants Co., is being used in this repair application by the Hartford Electric Machine Company of Hartford, Connecticut. In the two years since they have been using this plastic bearing retaining compound, no failures have occurred to bearings mounted in this manner.

This thin liquid plastic has the property of hardening when confined between closely fitting metal parts having clearances in the thousandths. It comes ready to use, does not re-

(Continued on page 60)

A TREMENDOUS BOOST AWAITS ALL PLANT EXECUTIVES AT THE 1962 PLANT ENGINEERING & MAINTENANCE SHOW & CONFERENCE • JANUARY 22-25 AT CONVENTION HALL, PHILADELPHIA, PENNSYLVANIA

Pack your problems in your briefcase and bring them for discussion with over 350 exhibiting companies and their engineers. Informative, exciting exhibits for you to see in every important field:

Air conditioning, heating, ventilating – building materials and services – communication systems – electrical equipment – instruments – inventory and work control systems – lubricants and lubricating equipment – maintenance tools and supplies – materials handling equipment – plant furniture – plant protection equipment – pollution control – plumbing equipment – power generation and distribution – finishes and finishing equipment – power transmission – safety equipment – sanitation and cleaning equipment – storage equipment – welding

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Address all inquiries to: **CLAPP & POLIAK, INC.**, Show Management, 341 Madison Avenue, New York 17, New York, MUrray Hill 4-3432.

Dimensioned to your requirements, this new C. H. Wheeler development is the most modern pump available for the chemical, process, heating, ventilating and air-conditioning industries.

BHO End Suction Centrifugal Pumps are offered in 350 Series (stainless steel and corrosion resistant materials) for chemical and 300 Series (cast iron alloys and bronzes) for general process services.

A complete range of 14 pump sizes from 1" to 5" in both series. The size and type you need to do your job. Available for immediate shipment.

Call your C. H. Wheeler representative for full details or write for 12-page catalog and pump design manual.

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Affiliated sources for heat exchangers, steam condensers, pumps, marine auxiliary equipment, sea water distillation plants, nuclear steam generators and related components.

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OPERATION—PRODUCTION

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quire mixing with a catalyst and does not air dry. A few drops will retain bearings without press fits and when mounted in this way bearings can be removed with ordinary removal tools.

This material is used in the same way to retain sleeve bearings and bushings in worn housings. Brass, bronze, fibre or nylon sleeves are also reportedly bonded with satisfactory results.

Silicon Rectifier Fights Arc-Back

ONE STEP in the electrical modernization at Alan Wood Steel Company's Conshohocken, Pa., plant involved replacement of a 25-cycle motor-generator set with a silicon rectifier. The new Unitron, a product of I-T-E Circuit Breaker Co., Philadelphia, Pa., supplies 1000 kw, 4000 amp at 250 v and was successfully added to the d-c loop system in parallel with three existing 1000 kw mercury-arc units.

The rectifiers are bussed into the same d-c switchgear; both have overload ratings of 125 per cent for two hours and 200 per cent for one min.

The silicon units overload protection scheme is designed to distinguish between arc-backs and bus or severe feeder faults. To assure continuity of service, it rides through an arc-back and picks up power load dropped by a mercury-arc unit when arc-back occurs.

Intumescent Paint Insulates Steel

APPLIED MUCH LIKE conventional coatings, fire-retardant paint has been useful in helping to make older buildings safer without reconstruction or replacement of combustible interior materials. Bell & Gossett Company of Morton Grove, Illinois, for example, has applied a fire-retardant paint to 83,000 sq ft of combustible fiberboard ceiling.

In addition, Kenneth Dopp, Plant Engineer, has gone one step further in reducing potential fire loss by also covering the steel roof beams and columns with a fire-retardant product of Albi Manufacturing Company, Inc., Rockville, Conn., in order to minimize the possibility of structural distortion or collapse.

On exposure to heat of 300 F or over, the paint swells into a black,

Here are five important questions . . . and their answers . . . on an important new Simplex development in electric power distribution and transmission

HIGH VOLTAGE POLYETHYLENE

INSULATED POWER CABLES

Q. *What are some of the advantages of Simplex polyethylene-insulated high voltage cables?*

A. Low dielectric constant (nearly 1/2 that of paper cables) . . . Low power factor (nearly 1/10 that of paper cables) . . . Low dielectric loss (nearly 1/20 that of paper cables) . . . Very high insulation resistance (at least 10 times that of paper cables) . . . High dielectric strength . . . (equal to paper cables).

Q. *What are some of the outstanding physical properties of Simplex polyethylene?*

A. Light weight (62% of paper cables) . . . High tensile strength (1800-2000 p.s.i.) . . . High elongation (400% minimum).

Q. *Where can Simplex polyethylene cables be used?*

A. In many places where rubber or paper cable is used. Typical installations are direct burial, duct or conduit, aerial and submarine.

Q. *What is the highest voltage at which Simplex polyethylene cables are rated?*

A. Simplex now has polyethylene cable rated as high as 46KV A-C. Development work now in progress is expected to extend Simplex polyethylene's voltage range to 69KV or higher.

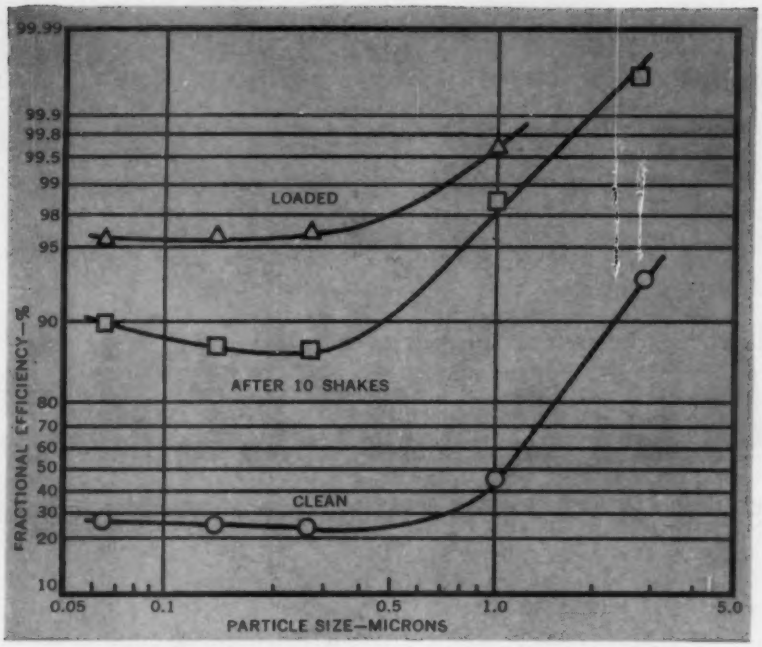
Q. *Has Simplex high voltage polyethylene cable been thoroughly field tested?*

A. Yes, as the leading producer of polyethylene cables, Simplex has in service more than 330 mile-years of polyethylene-insulated cable in the 5KV to 46KV range.

Send for complete information.

Simplex
WIRE & CABLE CO.
EXECUTIVE OFFICES: Cambridge, Mass.
Plants at Cambridge, Mass., Portsmouth, N. H., Westbury, L. I., Monrovia, Calif.

Circle 544 on postcard, page 33

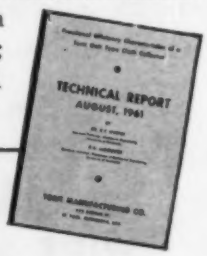


revolutionary "dust-making machine" proves Torit Dust Collectors have

HIGH AIR FILTERING EFFICIENCY

Because of an increase in critical dust collection problems and rising standards in industrial hygiene, need has arisen for more precise measurements of filtering efficiency. In the past, because of inability to produce uniform-size, sub-micron dust particles, filtering efficiency has been measured by weight. However, recently a homogeneous aerosol generator capable of producing uniform sub-micron particles as fine as .05 microns (1/500,000 inch) and as coarse as 15.0 microns, has been developed by Dr. K. T. Whitby, leading authority on particle technology. (Smoke, fumes, and bacteria fall within this range; most industrial dusts are 2 microns or larger.) Tests using such uniform particles indicate fractional efficiency based on particle count . . . the most exacting filter efficiency tests ever devised.

Under this most demanding of all filter tests, Torit Cloth Filter Dust Collectors performed superbly. Fractional efficiency when loaded with fine dust ranged from 96% at 0.1 micron to 99.99% at 2.5 microns; and after shaking 10 times, from 88% at 0.1 microns to 99.93% at 2.5 microns.



For further information, write for Dr. K. T. Whitby's Technical Report on the "Fractional Efficiency Characteristics of a Torit Unit Type Cloth Collector."

TORIT manufacturing company

1133 Rankin Street, St. Paul 16, Minnesota, Dept. 1836

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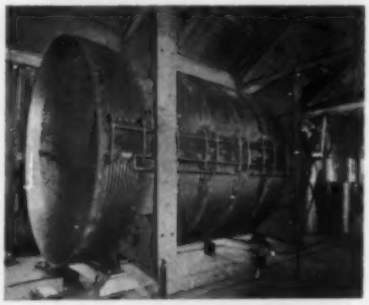
spongy cellular mat which may expand to a layer ½ in. thick but will only char at the point where heat or flame is applied. These air cavities form a protective heat insulation so that the temperature of the painted surface itself is much lower than that of the exposed mat surface.

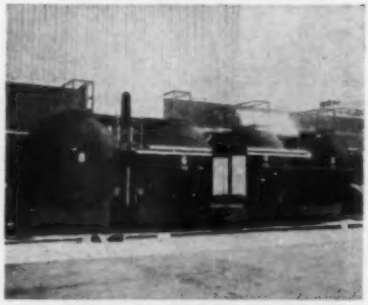
The insurance carrier has considered the use of fire-retardant paint which costs about 15 per cent more than conventional paints, a major factor in improvement of fire-safety conditions in the company's 21 buildings.

Heating Element "Wraps" Tank—Contaminate Risk Eliminated

THE METHOD of heating bulk shortening at the Pillsbury Company's New Albany, Indiana, plant

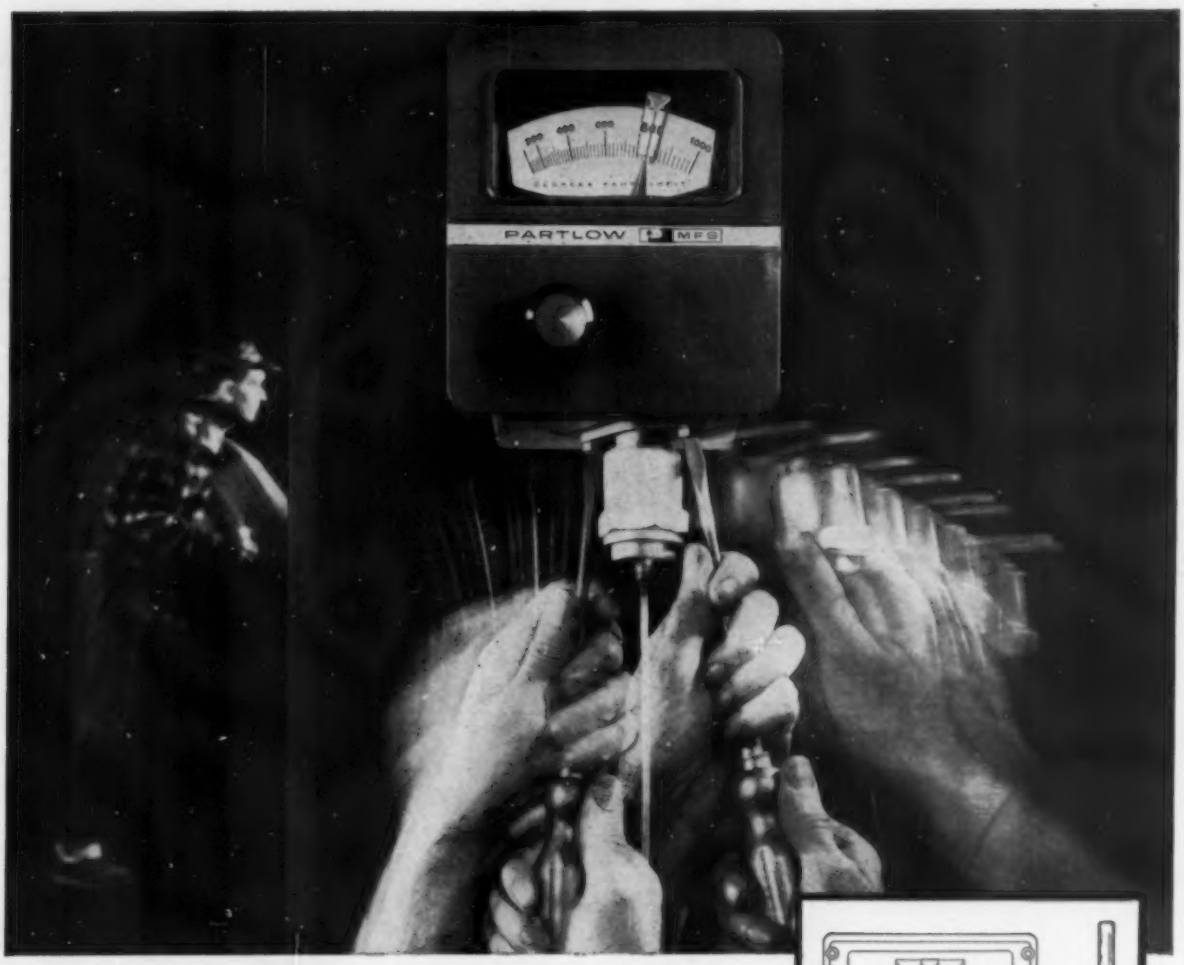


One of the 10,400 gal shortening heating tanks is shown under construction at the W. E. Caldwell Company plant.



In tank installation shown, the danger of product contamination from immersed coils has been eliminated.

was changed as insurance against the possible contamination of the shortening. The Tranter Manufacturing heat transfer unit responsible for this



The Temperature Control Designed for Fast

"DO IT YOURSELF" MAINTENANCE

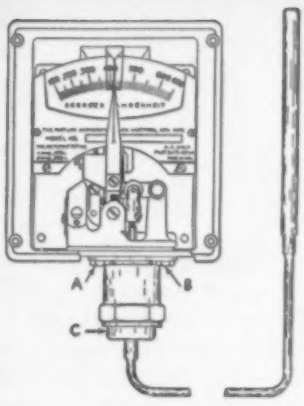
Right on the Job!

Rugged simplicity of design—along with the direct, positive power of mercury-actuation — combine to give Partlow maintenance and performance advantages no other type of temperature control can hope to equal.

Simplicity in the Partlow, for one thing, means that the control element can be changed *at the job site* in a matter of minutes with no other tool than a screwdriver . . . "Down time" is cut to an absolute minimum!

And simplicity in the Partlow also means the complete elimination of fussy electronic gadgets, delicate levers, hairsprings and other accessories that have a tendency to break down at the first trace of jar or jostle. Partlow controls are famous for their unfailingly accurate performance even under the most adverse operating conditions.

If you use or manufacture process equipment within the -30° to 1100° F. range, there's a Partlow pneumatic, electric or self-contained gas control (recording, indicating or non-indicating), to fit your application *precisely*. For details, write The Partlow Corp., New Hartford, New York. Dept. PE-1261.



Diagrammatic view of the new MFS reveals "quick-change" feature common to all Partlow controls. In case of damage, merely unscrew at points (A) and (B), and remove element (C) from case. Reverse this process, and your Partlow is ready to resume operation.

You can pay more but you can't buy better than

PARTLOW

TEMPERATURE CONTROLS

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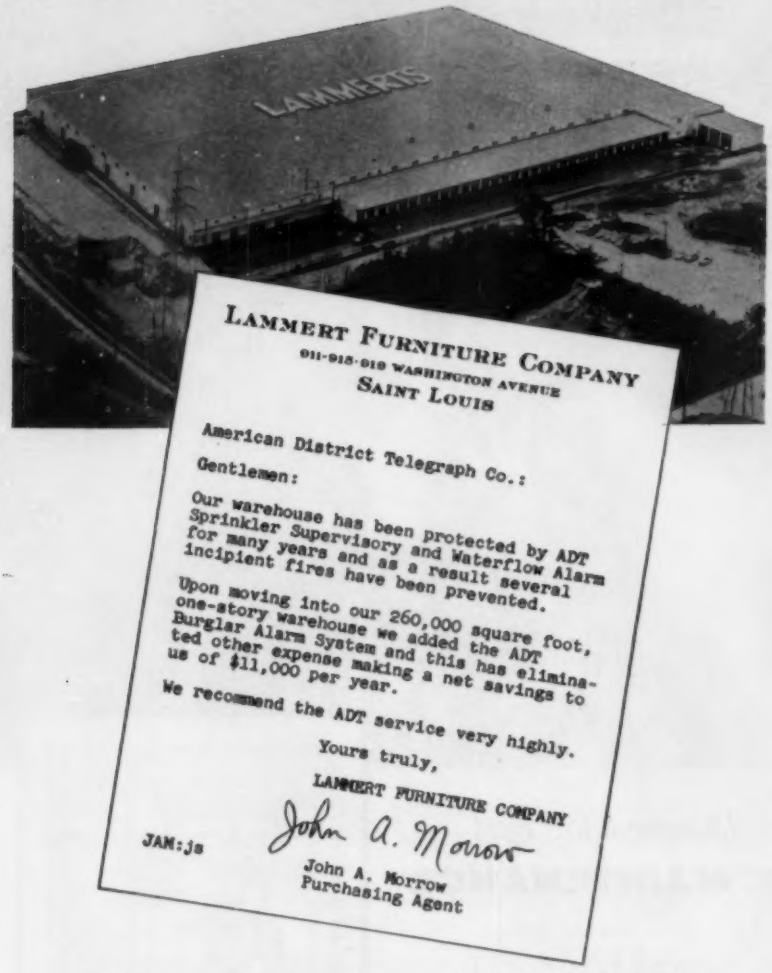
85 Broad St., New York 4, N. Y.

$11,000 saved annually with ADT protection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American District Telegraph Co.:
Gentlemen:
Our warehouse has been protected by ADT Sprinkler Supervisory and Waterflow Alarm for many years and as a result several incipient fires have been prevented.
Upon moving into our 260,000 square foot, one-story warehouse we added the ADT Burglar Alarm System and this has eliminated other expense making a net savings to us of $11,000 per year.
We recommend the ADT service very highly.
Yours truly,
LAMMERT FURNITURE COMPANY
JAM:js
John A. Morrow
John A. Morrow
Purchasing Agent

The Lammert Furniture Company is celebrating its 100th anniversary this year. One of the largest family-owned furniture stores in the country, Lammert's has flourished through three generations and has expanded to five locations, including the new warehouse pictured above.

Thousands of other successful firms from coast to coast rely upon ADT automatic protection services to protect their property, their employees and their profits. Like Lammert's they benefit by uninterrupted continuity of business and in most cases enjoy actual dollar savings.

If your property is not automatically protected, you owe it to yourself to find out what ADT can do for you. Chances are that you can have far greater security and save money, too! Call an ADT security specialist. He's listed in your telephone directory.

AMERICAN DISTRICT TELEGRAPH COMPANY
Executive Office: 155 Sixth Avenue, New York 13, N. Y.
A NATIONWIDE ORGANIZATION

ADT

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protection, consists of one flat and one embossed mild steel sheet welded together and formed to fit the exterior surface of the shortening tanks.

R. L. Buechler, Pillsbury Facility Engineer, said "Prior to the application of Platecoil we had heated bulk shortening with an immersed steam coil. Obviously, if a leak developed, the shortening became contaminated and costly product loss ensued."

The heating media for this application is water flowing at a rate of 15 gpm under a pressure of 20 psi which enters at a temperature of 140 F and leaves at 138 F.

Cleated Belt Stops Spillage

A TIGHT SQUEEZE in horizontal space available forced Dolese Bros. of Dallas, Texas to convey limestone up

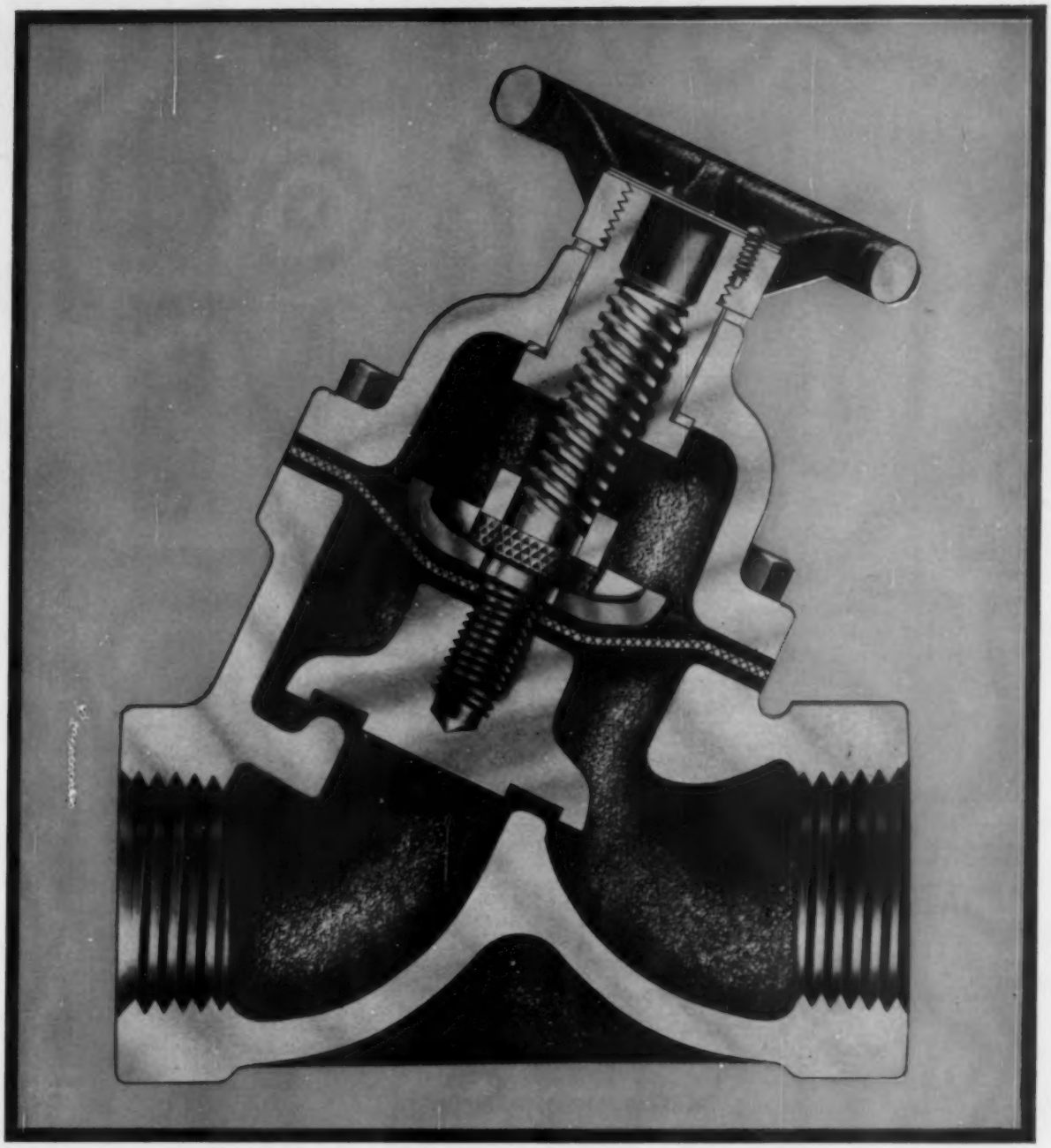
The ribs in this belt conveying crushed limestone up an 18-deg incline solved slipback encountered with flat belt.

a steep slope. As a result, material was spilling along the belt, especially at the incline loading point where a smooth belt would not take material away quickly enough.

A Hewitt-Robins Cleat-Top Belt, with molded pocket ribs and dams to prevent spreading of load on its top side, was installed, and the 2-in. crushed limestone stopped spilling. The 265 ft length of 30-in.-wide belt handles this stone on an 18 deg inclined conveyor at 250 fpm.

PM Pays Dividends

PREVENTIVE maintenance has reduced machine downtime and minimized parts replacement in the screw



Crane diaphragm valves...kind to compressors

Does your compressor run itself ragged pumping air through a leaky stuffing box?

Stop this expensive and annoying leakage with Crane Diaphragm Valves. Their "packless" design makes them ideally suited for service on compressed air lines.

No stem packing is required in this valve. The customary stuffing box around the stem has been eliminated through the use of a flexible diaphragm mounted between body and bonnet. The diaphragm keeps an absolutely tight stem seal and there is no chance of leakage.

Crane Diaphragm Valves are available in sizes ½" to 2" (Screwed ends in Bronze, Cast Iron, Aluminum and 18-8 SMo); ½" to 14" (Flanged ends in Cast Iron) and ½" to 6" (Flanged ends in Aluminum and 18-8 SMo).

The "packless" feature also makes these valves an excellent choice for many other fluids. For complete details contact your Crane Distributor. Or write to Crane Co., Dept. C, Industrial Products Group, 4100 S. Kedzie Ave., Chicago 32, Illinois.

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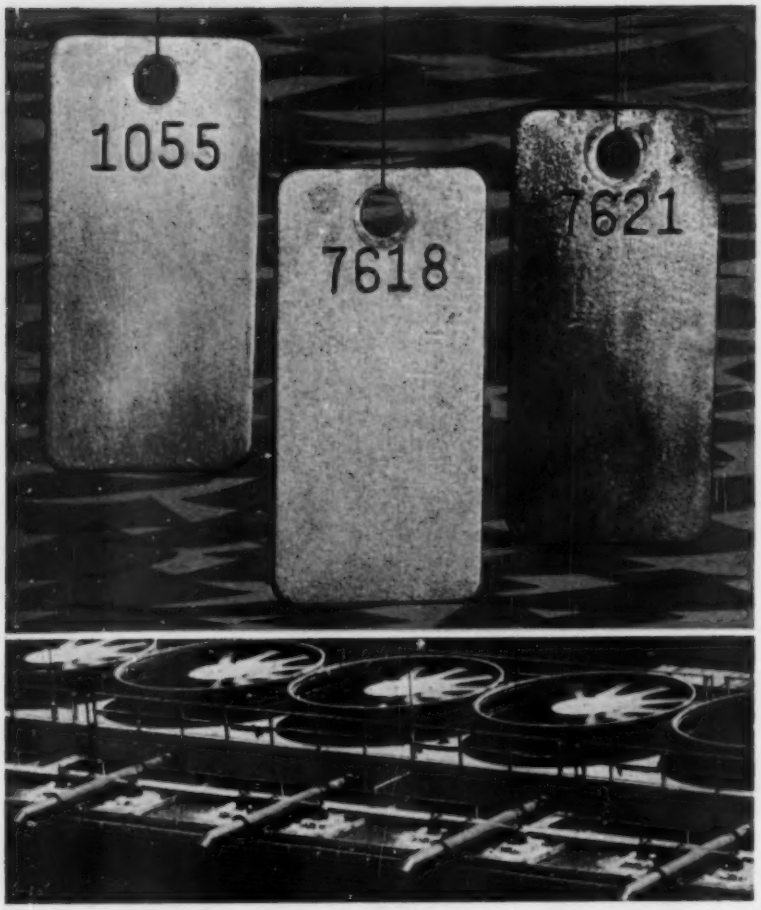
AT THE
HEART
OF HOME AND
INDUSTRY

CRANE

VALVES • PIPING • PUMPS
PLUMBING • HEATING • AIR CONDITIONING
WATER TREATMENT
ELECTRONIC CONTROLS • FITTINGS



in test after test
HAGATREAT IS MOST EFFECTIVE ... AT LOWEST COST PER DAY

Plant tests designed to determine which corrosion inhibitor provides the *lowest cost per degree of protection* usually indicate Hagatreat as the winner by a wide margin. Here are the results on test strips from one such test:

Specimen No.	Location	Treatment	corrosion rate mg/dm²/day	corrosion rate mils/yr
1055 (copper)	Blowdown	Hagatreat 168	0.41	0.06
7618 (steel)	Tower Sump	Hagatreat 168	0.58	0.11
7621 (steel)	Blowdown	Hagatreat 168	1.1	0.20

The low corrosion rate registered here is typical of Hagatreat results in plants all over the country. Hagatreat is effective with steel, copper, aluminum; in fact, complete treatment as recommended by the Hagan engineer is designed to protect the entire system, from cooling towers on through.

Complete information on Hagatreat or any of the Hagan water treatment chemicals is available on request. Write or phone for a Hagan engineer, or ask for the Hagatreat Bulletin—No. CSP-935.

HAGAN
CHEMICALS & CONTROLS, INC.
HAGAN CENTER, PITTSBURGH 30, PA.

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OPERATION—PRODUCTION

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Fig. 1. A repairman is shown checking oil flow on this screw machine.

machine department at The Timken Roller Bearing Company's Gambrinus plant near Canton, Ohio.

Their preventive maintenance program involves a weekly visual check of 62 machines. This is done by a craft repairman. He uses a special inspection sheet for each of 12 types of machines.

The visual check is made without shutting the machine down, and thus, without downtime or loss of production. Complete inspection sheets are returned to the department foreman. The foreman then designates when the repairs should be made. However, during the course of his inspection, should the repairman spot an emergency, he has authority to shut the machine down on the spot and notify the foreman of the emergency.

The operator takes care of any daily greasing that is necessary and is responsible for the lubrication of the machine itself. The oiler operates on a monthly schedule and is responsible for lubrication of the rams on the stock feed mechanisms.

A millwright lubricates the chucking spools every week. These are lubricated by the use of an outside fitting. The master mechanic schedules the changing of hydraulic oils in the hydraulic systems. This is done on a semi-annual and annual basis.

Timken's program of frequent visual inspection has proven that a minute of prevention is worth an hour of cure.

Heavy Duty Concrete Floors

The Problem. Producing a long-wearing heavy duty concrete floor is difficult—even under ideal conditions, using the best materials and workmanship. But even the best plain concrete floors often dust, ravel, shatter and disintegrate from heavy duty usage in a short time after being put into service. And because of the relatively high absorption of plain concrete, these floors are frequently attacked by the corrosive materials used or manufactured in these areas.

Technical Considerations. A heavy duty concrete floor should meet these minimum requirements:

1. The concrete slab should be structurally sound . . . sufficiently reinforced . . . of adequate thickness and strength . . . and produced with high-quality concrete materials.
2. The *surface* of the floor should be designed to withstand the following conditions:
   - Present and anticipated point loads and severity of traffic.
   - The range of exposure conditions peculiar to the industry and to the specific operating area.
   - The type of cleaning dictated by the particular industry.
3. The floor should be practicable and economical to install...utilizing, wherever possible, locally available materials, equipment and workmanship.
4. The floor should require minimum maintenance . . . and be easy to repair.

Properties of various types of concrete floors, floor aggregates and surface treatments: Summarized from reports of the National Bureau of Standards, Research Paper RP-1252, Volume 23, November, 1939, Journal of American Concrete Institute Proceedings, Volume 50-18 and Bureau of Reclamation studies reported in Engineering News-Record, April 21, 1955.

Cured vs. Uncured Concrete Floors

Proper curing of a concrete floor not only produces higher strength, but also reduces shrinkage and cracking and increases abrasion resistance. Dusting is associated most frequently with improperly cured floors.

Chemically-Treated Concrete Floors vs. Properly Cured Floors

Chemical treatments are of greatest value when applied over floors that were not properly cured. Even then, the abrasion resistance is not nearly equal to a properly cured floor. A chemical after-treatment will, if used repeatedly, arrest dusting.

Metallic vs. Natural Aggregate

Specially-prepared metallic aggregate, when applied as a dust coat over freshly-floated concrete, provides a floor finish with 4 to 8 times greater impact and abrasion resistance than the same properly cured concrete without the metallic aggregate surface. The metallic hardened surface is non-dusting, virtually non-absorbent and is resistant to oil and many industrial corrosives. Floors finished with various types of natural aggregate (silica, traprock and emery) do not differ significantly from each other in abrasion resistance, but are not equal to the metal aggregate.

Function of MASTERPLATE® in producing wear-resistant concrete floors

MASTERPLATE is metallic aggregate—tough, malleable, specially-processed and size-graded iron particles—combined with Master Builders exclusive water-reducing agent and other components which improve the properties of the finished floor. These components make it possible to easily incorporate a pound or more of MASTERPLATE per sq. ft. of floor . . . and keep the iron-armouring at the surface.

Advantages of the MASTERPLATE Floor

1. *Wear Resistance:* 4 to 8 times greater than the best plain concrete floor.
2. *Non-Dusting:* The malleable, high-strength MASTERPLATE surface does not fracture whereas natural aggregates fracture easily under impact.
3. *Low Absorption And Corrosion Resistance:* Oil, grease and corrosive solutions do not penetrate the surface. Spills can be easily cleaned.
4. *Slip Resistance* (When Desired): Swirl trowelling the surface produces ridges of "reinforced concrete."
5. *Easy-to-Clean:* Withstands repeated scrubbing, steam and strong cleansing compounds.
6. *Color* (When Desired): Available in 11 colors for industrial areas, institutional and commercial buildings.
7. *Economical:* Only 15¢ to 20¢ per sq. ft. more than the concrete to which it is applied . . . the most economical industrial floor surface known to industry today.

Estimating Data

Type of Service	Thickness of MASTERPLATE
Heavy Duty	1.0 to 1.25 lbs. per sq. ft.
Extra Heavy Duty	(Use ANVIL-TOP® — consult your Master Builders field man.)

Note: For areas subject to less heavy usage, quantities less than 1 lb. of MASTERPLATE per square foot will produce proportionately good results.

Suggested Specification Clauses

General Conditions: Floors designated to be surfaced with an approved metallic aggregate surface hardener shall be finished in a manner described in the following paragraphs of this specification utilizing the services supplied at no cost to the contractor, of a specially-trained concrete technician, a full-time employee of the metallic aggregate manufacturer.

Cement: The cement to be mixed with the metallic aggregate shall be portland cement conforming to Type I of the current ASTM Specification C-150.

Metallic Aggregate, Non-Colored: The metallic aggregate, specially-processed and formulated for specific use as a surface hardener, shall be MASTERPLATE as manufactured by The Master Builders Company (Cleveland, Ohio). Material delivered to the job site showing any rusting of the metallic aggregate or presence of oil shall be rejected. It shall be mixed with portland cement, applied to the fresh concrete, finished and cured in accordance with the manufacturer's recommendations given on the job by his aforementioned job representative.

Curing: Floors finished with the metallic aggregate surface hardener shall be cured with an approved membrane curing compound applied immediately after the floor surface has hardened sufficiently so that it will not be marred by the application.

For a copy of complete suggested heavy duty concrete floor specifications, or for additional information on MASTERPLATE, contact the local Master Builders field man.

Heavy Duty Concrete Floors

Our 50th Year

The **MASTER BUILDERS** Co.

Division of American-Marietta Company • Cleveland 18, Ohio • World-wide manufacturing and service facilities

MASTERPLATE is a registered trademark of the Master Builders Co. for its specially-prepared, metallic aggregate for producing wear-resistant, heavy duty concrete floors.

Circle 550 on postcard, page 33

INCREASE YOUR CURRENT

American Steel and Wire
Division of
United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad

CARRYING CAPACITY 45% ...with USS Amerzone-B insulation*

Amerzone-B butyl rubber insulation can be safely operated continuously at 90°C copper temperature. This means you get a 45% increase in current-carrying capacity with Amerzone-B as compared to the capacity of standard 60°C rated compounds. For network service, Amerzone-B will withstand emergency overload copper temperatures *up to 260°* for short periods without damage. No other rubber insulation has such exceptional resistance to heat, moisture, ozone and cold. You can bend it at —40°F. without cracking. Ozone tests to industry standards show no damage to this dense, nonporous insulation. Amerzone-B insulated cables installed over 12 years ago are just as good today as they were when installed. It's the ideal insulation for 5,000 to 15,000-volt cable. You can use USS Tiger Brand type RR Cable with Amerzone-B insulation anywhere . . . bury it, put it in conduits or ducts, string it overhead.

USS Tiger Brand type RR Cables are also made with other types of rubber insulation, each one compounded to do a special job. For complete information on Amerzone-B insulated cables or any other Tiger Brand Cable, call our nearest Sales Office or write American Steel and Wire, Dept. 1601, Rockefeller Building, Cleveland 13, Ohio.

USS, Tiger Brand and Amerzone-B are registered trademarks

*Conditions: 3 single conductors # 4/0 in 2½" conduit (exposed & enclosed), 40°C ambient air temperature

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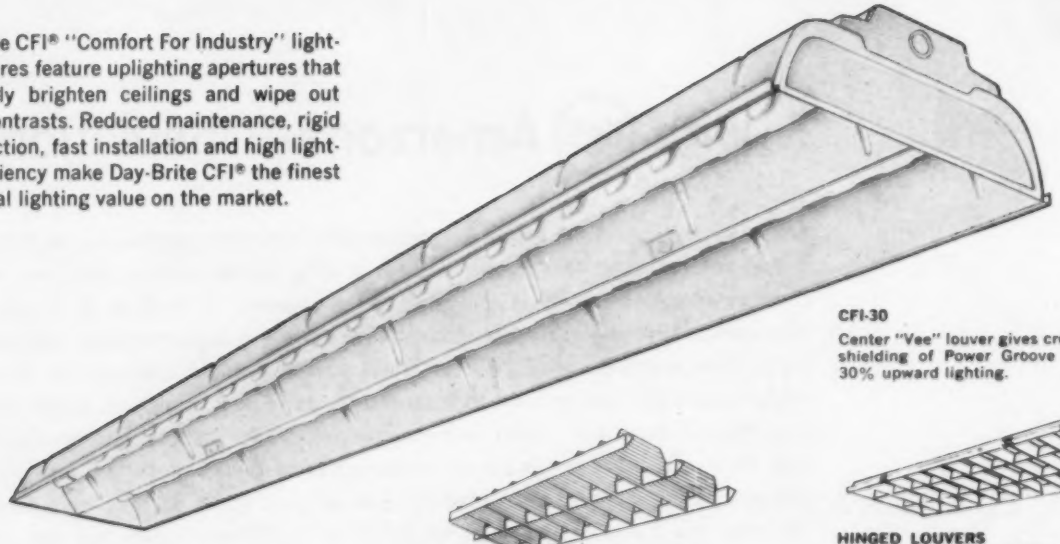
Whatever your reasons for wanting

- ☐ Increase production
- ☐ Avoid mistakes
- ☐ Utilize space better
- ☐ Prevent accidents

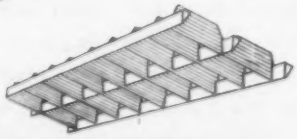
...you'll find the answers in

Day-Brite CFI® "Comfort For Industry" lighting fixtures feature uplighting apertures that cheerfully brighten ceilings and wipe out harsh contrasts. Reduced maintenance, rigid construction, fast installation and high lighting efficiency make Day-Brite CFI® the finest industrial lighting value on the market.



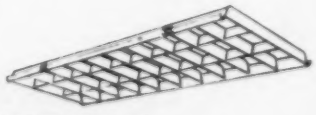
CFI-30

Center "Vee" louver gives crosswise shielding of Power Groove lamps. 30% upward lighting.



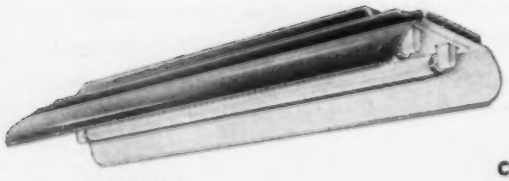
HINGED ALZAK ALUMINUM PARALOUVERS®

Provide the ultimate in visual comfort. Use with CFI-25 and CFI-30 fixtures. PARALOUVER Patent Nos. 2633799 and 507541.



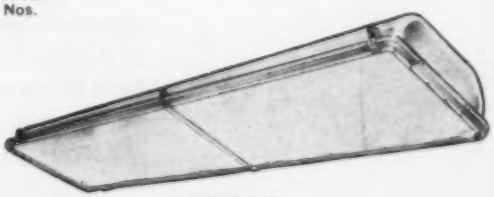
HINGED LOUVERS
(Baked white finish)

Use for critical seeing tasks requiring additional shielding, with CFI-10, CFI-15, CFI-25 or CFI-30 fixtures.



RS-240-TT

For Rapid-Start lamps. Economy . . . with quality features.



VAPOR-TIGHT

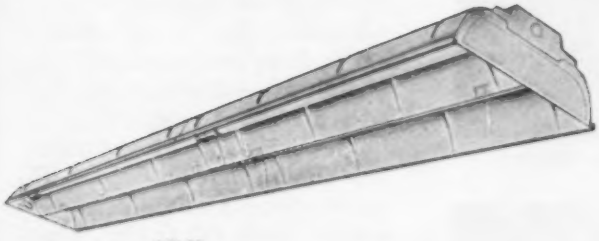
Use where fixtures are exposed to moisture or where non-combustible dust is present. Vinyl gasketed frame. Uses Rapid-Start lamps.

Circle 552 on postcard, page 33

to improve your plant lighting

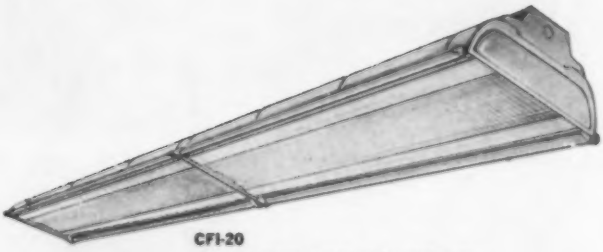
- ☐ Improve morale
- ☐ Reduce employee fatigue
- ☐ Improve housekeeping
- ☐ Impress visitors

the complete Day-Brite line



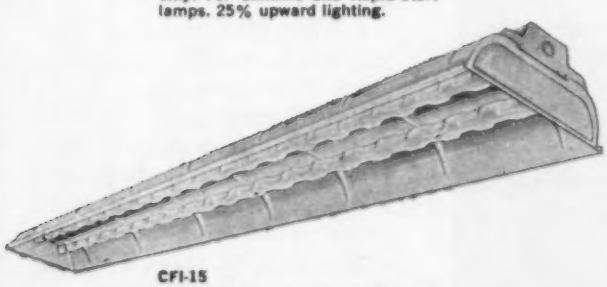
CFI-25

Excellent visual comfort and economy. For Slimline and Rapid-Start lamps. 25% upward lighting.



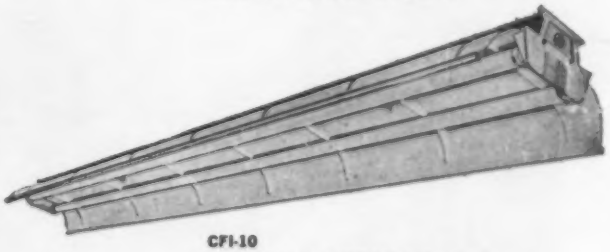
CFI-20

Power-Groove lamps with minimum glare. Cleartex® bottom panel reduces reflection from shiny work surfaces. 23% upward lighting.



CFI-15

For Power-Groove lamps. Closed ends, rigid rib construction. 15% upward lighting.



CFI-10

For Slimline and Rapid-Start lamps. Provides 10% upward lighting through die-embossed apertures.

Get your FREE 16-page "Guide to Modernization and Relighting"

Tells how to estimate your lighting needs for increased production and profit. Includes current recommended illumination levels and photographs of actual modern applications. Write: Day-Brite Lighting, Inc., 6260 N. Broadway, St. Louis 15, Mo.

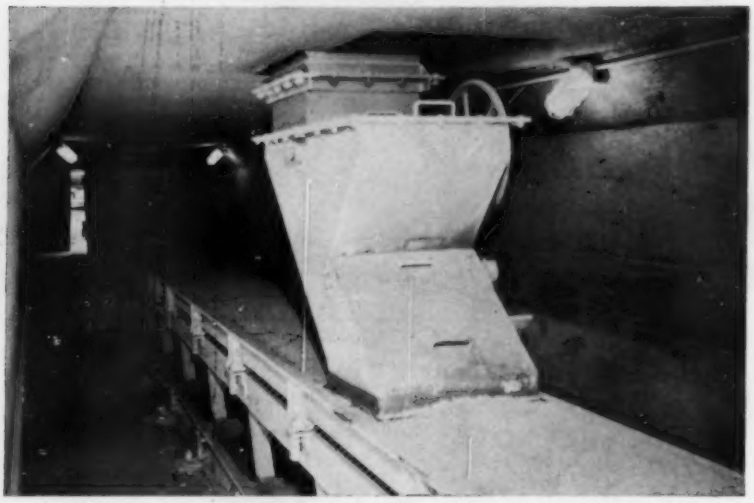
DAY-BRITE

Day-Brite Lighting, Inc., St. Louis, Mo., and Santa Clara, Calif.
In Canada: Amalgamated Electric Corp., Ltd. Toronto 8, Ont.

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

Jeffrey processing equipment assures accurate controls in lime plant

Sixteen Jeffrey vibrating feeders draw burned lime from the four kilns for further processing.



Finished lime, feeding from silos onto this Jeffrey HMV conveyor, is blended to suit customers' needs.

Strategically located in the Flats at Cleveland, this Cuyahoga Lime Company plant makes burnt lime immediately available to the two oxygen steel-making plants it serves. As those facilities are increased, the layout here allows for expansion to meet demands.

Sixteen Jeffrey 18" x 38" vibrating feeders are installed; four feeders serve each of the four kilns; all have electronic amplitude control for precise metering of burnt lime for further processing. It passes through an adjustable Jeffrey double roll crusher, after which the lime is stored in three silos according to size.

A Jeffrey HMV conveyor, 71' 6" long and completely enclosed to make it dustproof, runs along under the three silos where the finished lime is stored. Here various sizes are proportioned and blended to meet customers' requirements.

The Jeffrey Manufacturing Company, 905 North Fourth St., Columbus 16, Ohio.

If it's conveyed, processed or mined, it's a job for Jeffrey.

JEFFREY

Circle 553 on postcard, page 33

Protective Lighting starts at the Perimeter Fence *with a.....*

CROUSE-HINDS

WALL OF LIGHT

PLB

The wide horizontal and narrow vertical spread of Crouse-Hinds Fresnel-beam Floodlights conceals plants, testing areas, missile sites and other sensitive locations behind a blinding wall of maximum-security illumination. PLB's dazzling glare projected beyond the perimeter fence clearly outlines all movement on the approaches, yet obscures guard, patrol and other activity on plant property.

Modified beams conform to land contours. No shadows. No blind spots. Multiple and series types afford economical current distribution for varying line lengths. A range of sizes, wattages and foot-candles satisfy all plant-geometry and topographical requirements.

ADE
incandescent

MVE
mercury-vapor

ADE and MVE Productive-Area Floodlights turn Nighttime into Day

Whether you need incandescent ADE or mercury-vapor MVE lights for your plant or building areas depends on hours of burning, relamping difficulties and labor costs. Whatever your requirements, wide or narrow beam, short or long range, Crouse-Hinds has a highly-efficient, heavy-duty projector especially for the job.

For detailed information call your Crouse-Hinds distributor or ask for Floodlight Catalog No. 2714.

CROUSE HINDS

REG. U.S. PAT. OFF.

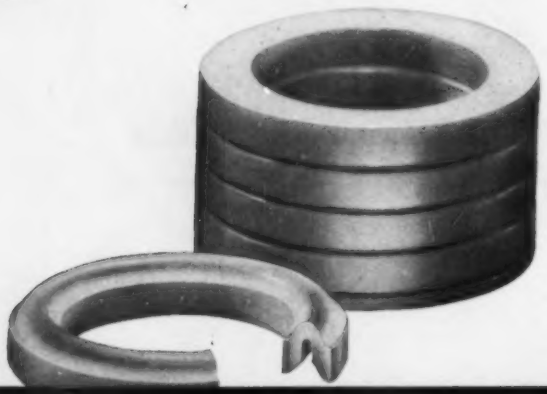
MAIN OFFICE: SYRACUSE, N.Y. FIELD OFFICES: Albany, Atlanta, Baton Rouge, Birmingham, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Corpus Christi, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Oregon, St. Louis, St. Paul, Salt Lake City, San Francisco, Seattle, Tampa, Tulsa, Washington. RESIDENT REPRESENTATIVES: Baltimore, Md., Meriden, Conn., Reading, Pa., Richmond, Va., Springfield, Mass. Crouse-Hinds of Canada, Ltd., Scarborough, Ont. Crouse-Hinds-Domex, S.A. de C.V. Mexico City, D.F. Peterco, Sao Paulo, Brazil

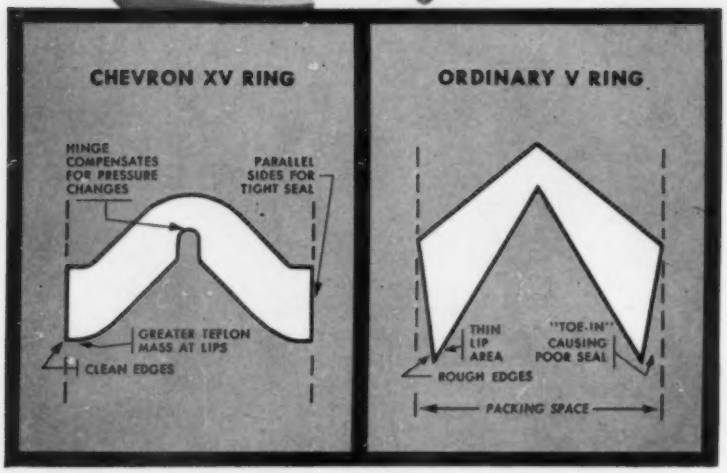
Circle 554 on postcard, page 33

NEW

GARLOCK CHEVRON* XV TEFLON† PACKING

for Hydraulic, Pneumatic Service





A new high in V-ring performance and efficiency is here from Garlock in the new CHEVRON XV Teflon Packings. Used for valves, pumps and instruments in corrosive service, this exclusive Garlock design has outperformed ordinary Teflon V-rings in rigid controlled tests. CHEVRON XV is superior in flexibility, freedom from friction, wear resistance and sealing efficiency under varying pressures—withstands pressures to 1000 p.s.i. (rings without hinges available for pressures above 1000 p.s.i.).

Can be molded precisely. The greater material mass of CHEVRON XV permits molding to consistent close tolerances ring after ring—batch after batch. Result—perfect fit, clean lips, far better sealing.

Ends frequent gland adjustment. The exclusive CHEVRON hinge compensates for pressure changes automatically. With proper installation, further adjustments are eliminated.

Greatly extends wear. Greater material mass and parallel sides give Garlock CHEVRON XV PACKINGS much more working Teflon than ordinary V-rings. Sturdier size for size, they wear considerably longer . . . yet cost you no more.

Virtually ends friction because of two factors. First, Teflon has the lowest coefficient of breakaway and running friction of any solid material in use today. Second, the exclusive CHEVRON hinge action permits free operation with minimum friction at all pressures.

Learn the full story of this superior new packing. Discuss your particular needs with your Garlock representative. Call him at the nearest of 26 Garlock sales offices and warehouses throughout the U.S. and Canada. Or, write for Catalog AD-192, Garlock Inc., Palmyra, New York.

GARLOCK

Canadian Div.: Garlock of Canada Ltd.

Plastics Div.: United States Gasket Co.

Order from the complete line of quality Garlock products . . . Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Stock and Parts.

*Registered Trademark †Du Pont Trademark

Circle 555 on postcard, page 33

COSTS LESS TO BUY AND ERECT!

New one-piece shelf clips lower shelving costs—can be installed without tools. Made of heavy gauge steel, the clips are strong enough to support heavy loads.

Up to 50% saving on erecting costs. This standard 8-shelf unit was erected by 2 men in less than 10 minutes, thanks to the new one-piece shelf clips.

GIVES GREATER ADJUSTABILITY!

New clip-type shelves go in and out without tilting. Shelves need not be unloaded to be repositioned. What's more, no tools are required to make shelf adjustments.

Shelves are adjustable on 1½" centers. This feature, plus the beaded front post, eliminates wasted space—gives more useable storage capacity in less floor space.

HALLOWELL

CLIP TYPE *ERECTOMATIC*® SHELVING

CHECK THESE OTHER ADVANTAGES:

- Interchangeable with regular Erectomatic shelves and shelf supports.
- New clip fits flat against post—does not steal storage space.
- New, stronger shelves. Corners are lapped and spot welded.
- Available on the most liberal lease plan in the industry.

COLUMBIA-HALLOWELL Division
JENKINTOWN 26, PA.•SANTA ANA, CALIFORNIA

SPS

where reliability replaces probability

MAIL COUPON FOR FREE CATALOG

COLUMBIA-HALLOWELL Division SPS
Jenkintown 26, Pa.

Please send me catalog on new Hallowell Clip-Type Erectomatic Shelving

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Circle 556 on postcard, page 33

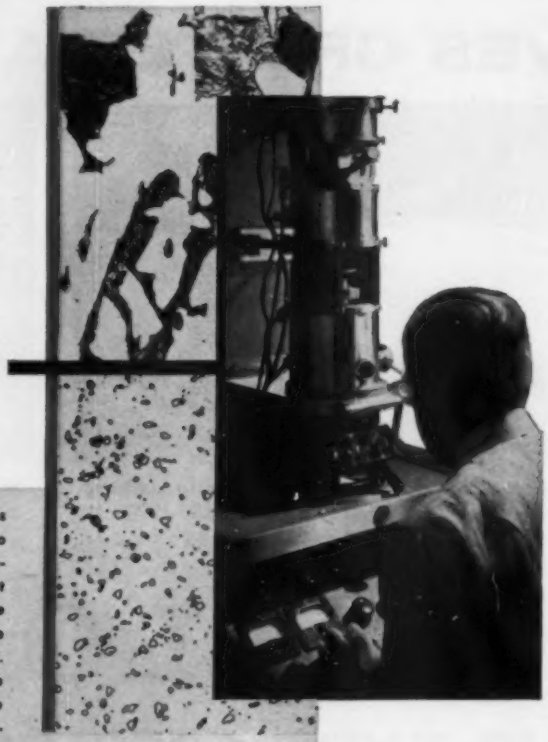
It Should Never Happen To You...

...But When It Does, You Need Expert Advice!

Nalco's Specialized Metallurgical Skills and Facilities Find Causes; Prevent Metal Failures

A ruptured boiler tube is a catastrophe wherever and whenever it occurs. The one shown above, sent to Nalco Laboratories for metallurgical analysis, revealed that prolonged overheating was the basic cause, with several contributing factors. Recommended changes in chemical treatment and operative procedures can help prevent recurrence.

Boiler metal failures are not a frequent occurrence in modern steam plants. But with thousands of operating boilers in service, failures do occur . . . enough of them to make necessary keeping Nalco's specialized metallurgical skills and facilities at work analyzing failures and their causes, with the continuing aim of developing "failure-proof" chemical treatment and control techniques.



Carefully selected, ground, polished, and etched steel specimens give up their secrets under metallographic microscopes at Nalco (right). At left top is a normal low-carbon steel boiler tube structure, showing the intermixed crystals of ferrite and pearlite at 500 magnifications. Below normal structure is a section of tube metal at the same magnification which has developed carbide spheroidization, indicating undesirably high metal temperatures. This change in structure occurs after prolonged heating in the range of 900° F. to 1350° F., and is a combined function of time and temperature—occurring very slowly at 900° F., but often requiring only a few hours to develop at 1350° F.

Nalco's accumulation of metallurgical research and experience may be helping to protect your boiler metal against failure right now. Nalco was first among water treatment organizations to recognize the importance of metallurgy and metallography in complete water treatment services . . . And first to install the facilities and experts to track down the frequently obscure causes of metal failure. Finding preventive measures, both chemical and physical, has been going on in the Nalco Laboratories for about 25 years.

Complete metallurgical analysis must take in the entire situation. At Nalco, such a complete investigation may include water analysis, gravimetric analysis, flame photometry, X-ray diffraction, electron microscopy, and electron diffraction and spectroscopy. To our knowledge, Nalco is the only water treatment organization capable of making such complete investigations in this highly specialized field. For further data on boiler metallurgy, write for free Nalco Bulletin 61, and Nalco Reprint 32. To obtain prompt consultation regarding water treatment problems, call your Nalco Representative.

NALCO CHEMICAL COMPANY

6217 West 66th Place • Chicago 38, Illinois

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Circle 557 on postcard, page 33

CONSTRUCTION BRIEFS - reviewing methods and materials for the plant engineer

Edited by H. E. B. Anderson

PORCELAIN ENAMEL COATED STEEL SHEET

GENERAL USE of porcelain enameled steel sheet has formerly been confined to highly corrosive exposures, because of the relatively high cost of this type of protective coating. And, because the 10- to 15-mil buildup required produced problems in field construction.

More recently, as reported by the Porcelain Enamel Institute, several leading steel producers have made available a special steel which permits the application of a full spectrum of direct-on colors in 3- to 4-mil coatings. The sheet can be drilled and fastened with conventional fastening systems.

Since 1940, at the Canton, Ohio and nearby Gambrinus plants of the Timken Roller Company's Steel and Tube Div., more than 500,000 sq ft of roof area has been roofed with porcelain enameled 20 gage metal.

In two buildings where acid condensation inside the building was high, the enameled roof panels have been in place 20 years. In 1949, 250,000 sq ft of porcelain enamel roofing was applied to seven plant buildings, at a cost of $143,000. The only maintenance required has been infrequent replacement of the holding screws.

To offset deterioration of roofs by heat, porcelain enamel steel roofing was installed over the hot bed portion of Timken's 22-in. rolling mill building. Here, the material has been maintenance free. Subsequently, the coated sheets have been installed on two other buildings.

Another successful installation of porcelain enameled sheets is at the Clairton Works of U.S. Steel Corp. Roofing and siding on the boiler house and water treatment plant accounted for 1,600,000 sq ft; continuous Monovent, adjustable and fixed louvers were fabricated from enameled sheet.

In quenching operations at the Clairton coke plant, highly saturated vapor, from waste liquors used in quenching, is discharged from the quencher stack, and settles on the surrounding buildings. This quenching liquid, with a pH of 7 to 9, carries about 3 per cent chlorides—particularly damaging to metal and paint.

The boiler house and water treatment plant have withstood this attack; performance of the enameled sheets since their installation 2 years ago has been excellent. In the louvers and Monovents handling these saturated vapors, the ceramic protection has eliminated the usual maintenance requirements. In these areas, where personnel would have to work at dangerous heights, elimination of maintenance is doubly rewarding. **End**

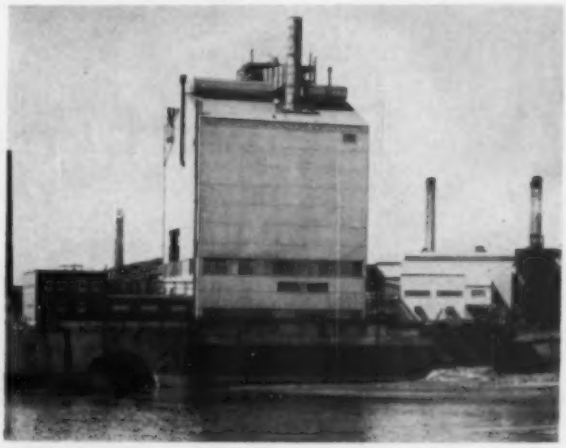


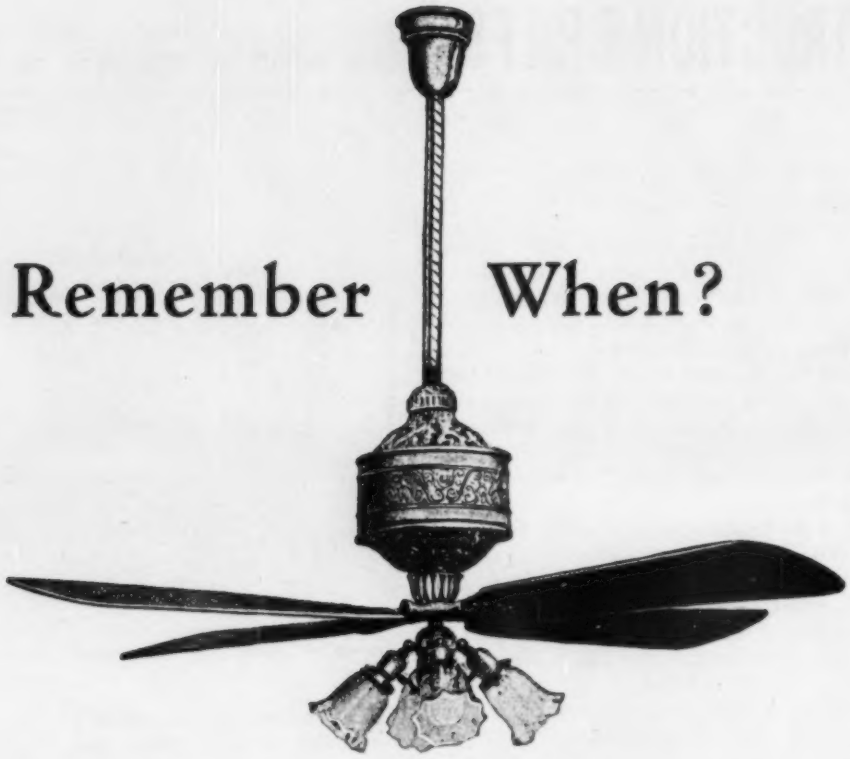
Fig. 3. Boiler house is sheathed in porcelain enameled sheets to resist corrosive "rain" from coking process.

Fig. 1. Center roof section of mill building is covered with porcelain enameled sheets, installed 20 years ago.

Fig. 2. Porcelain enameled sheets make up roof sections at left. Installed in 1950, it covers steel mill hot bed.

Fig. 4. Typical ventilating unit atop boiler house and water treating plant was fabricated of coated panels.

Remember When?



"You Can't be Cheerless Where There's a Peerless"

"If you're a fan user, Peerless Fans steady cooling current and its noiseless, reliable operation will cheer you. If you're a supply dealer, Peerless Fans steady and increasing sales will cheer you."

This headline and copy sold Peerless Electric Fans in 1907.

TODAY...the story's much the same, although the product has grown to huge, man-dwarfing units that are standard, specified equipment in hospitals, apartment houses, government installations, industrial plants and other places where moving large quantities of air is required. The same dependable, quiet, unobtrusive operation is there.

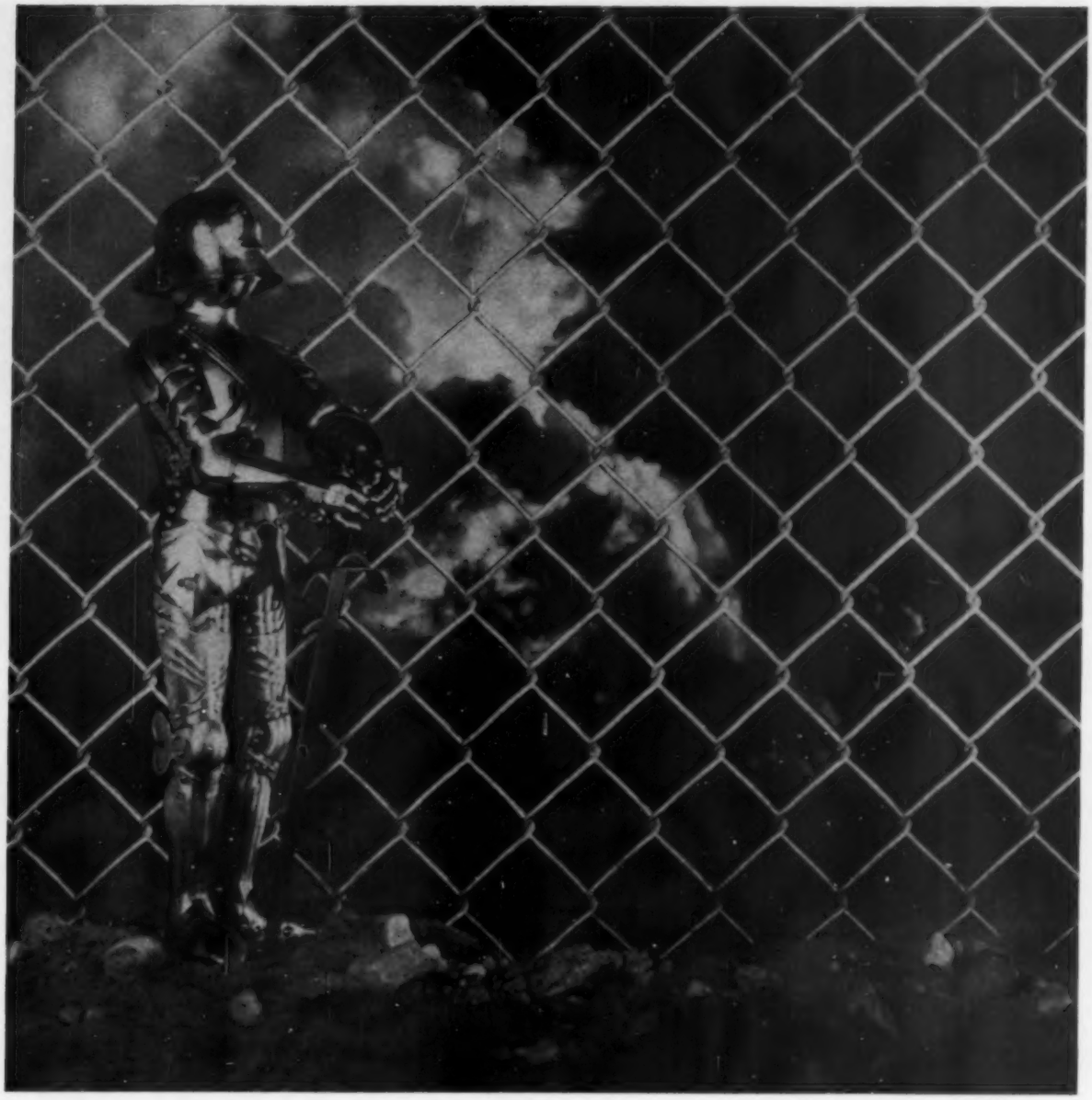
Investigate Peerless Air Moving Equipment Today! Write to Peerless Electric Division, H. K. Porter Company, Inc., 1405 West Market St., Warren, Ohio.

Manufactured and sold in the western states by Master Fan Corporation, H. K. Porter Company, Inc., 1323 Channing Street, Los Angeles 21, California. NOW AVAILABLE—Centrifugal Blowers to 132" wheel diameter, Turbo Blowers to 55" S. P., Tube and Vaneaxial Blowers and Industrial Fans to 104" wheel diameter.

PORTER **PEERLESS ELECTRIC DIVISION**
H. K. PORTER COMPANY, INC.

Member—Air Moving and Conditioning Association, Inc.

Circle 558 on postcard, page 33



Recognize this symbol of protection?

It's a Realock Chain Link Fence—the safe, permanent way to protect your property. Realock's quality fabric is made from top grade steel wire that withstands lots of punishment. For long-lasting protection, the fabric is expertly galvanized to prevent corrosion.

Realock Fence is available in a variety of styles. For a free estimate and complete details about Realock Fence, call the nearest CF&I sales office.

The Colorado Fuel and Iron Corporation
Denver • Oakland • New York
Sales Offices in Key Cities

Circle 559 on postcard, page 33

SUN CUTTING OIL SAVES SIX WAYS. A typewriter manufacturer was producing pins, fasteners, and other parts from Bessemer screw stock on Brown and Sharpes and New Britain Gridleys. Finishes were poor, production slow, tool life below average. Work from cut-off was too hot to handle and there was excessive smoking. Analysis showed the cutting oil was deficient in antiweld and lubricity. Sunicut 11 Cutting Oil was recommended and its use resulted in immediate improvement in all trouble areas. In addition . . . savings on oil cost alone ran $6300 a year, proof that Sun quality does not mean a premium price!

SWITCH TO A SUN GREASE STOPS TROUBLE! A system of delicately balanced propellers produces the big wind in this huge transonic wind tunnel. Control mechanisms at the roots of the blades consist of several small sets of spur gears, antifriction bearings on gear shafts, and four 10-inch antifriction thrust bearings. *Oil* was being used for lubrication, but oil leaked . . . caused unbalance, violent vibration, gear and bearing failures. Sun 1897 *Grease* was recommended. An assembly was packed; leakage stopped. After 18 months, the Sun grease was still in service; not one bearing or gear failure had occurred!

Are you stymied by the question:

SUNOCO

QUALITY . . .
THE BEST ECONOMY OF ALL

Actually,
the answer is
simple enough:

SUN OIL COMPANY

HYDRAULIC OILS, SUNOCO SERVICE CUT LOSS! A molder of fiber glass products operates several plants. In one, leakage was causing frequent downtime of six presses molding fiber glass trays. A Sun man analyzed the trouble, recommended Suntac 302, one of the many Suntac oils designed to combat leakage in hydraulic and circulating systems. At another plant, production of boat hulls like the one shown here was stymied by a contaminated oil. The Sun man swung into action . . . brought in equipment to salvage the oil, saving a sizeable sum through *service*. Now job-fitted Sun Solnus 300 is *keeping* production rolling!

SOLNUS OIL CUTS MAINTENANCE 50%! A Pennsylvania manufacturer compared performance of his regular compressor oil with Sun Solnus 300 in a Chicago Pneumatic air compressor for two rigid test periods of eight months each. The Solnus 300 cut discharge valve maintenance from 4.12 manhours per month to 1.82, intake valve maintenance from 5.68 to 3.00, and all valve maintenance from 9.87 to 4.87 . . . maintenance savings of 50%. Dollar savings ran a tidy $915 a year! Where can your Sun Representative help you save with the quality performance of the right job-fitted Sunoco product for you?

Which petroleum product?

Get the *product quality* it takes to keep you rolling . . . job-fitted by men who *know what they're doing* . . . teamed with the *service* you have a right to expect! Try a Sunoco product in your plant. It's the fastest way to convince yourself that investing in Sun quality can be good for you.

PHILADELPHIA 3, PA., DEPT. PY-12 • **In Canada, Sun Oil Company Limited, Toronto and Montreal.**

Circle 560 on postcard, page 33

ARCHITECTS: Warnecke and Warnecke. GENERAL CONTRACTORS: Rothschild, Raffin and Weirick, Inc. MECHANICAL CONTRACTORS: Herman Lawson Company. (All of San Francisco)

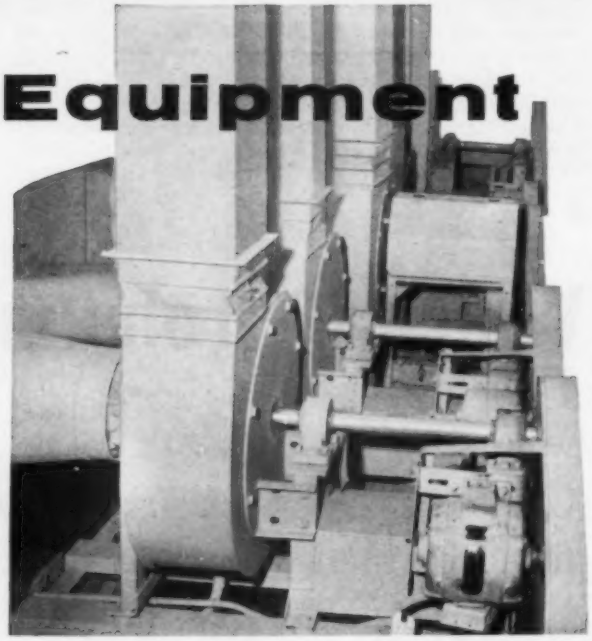
NEWEST AND MOST ADVANCED of the Earth Science Laboratories . . . uses

CLARAGE Equipment

ASSIGNMENT: AIR HANDLING in this new six-story, reinforced concrete structure for the Study of Geography, Geology, and Paleontology at a leading West Coast university.

Aiding students, staff, and classroom experiments are 39 Clarage Fans in general comfort and specialized laboratory hood exhaust applications.

Yes, for notable buildings the world over, Clarage air handling and conditioning equipment is a frequent choice because of its long-standing reputation for quiet, economical, dependable service. You too can profit by investigating the *quality* line we manufacture for buildings of all types, all sizes.



Largest of the 39 Clarage Fans installed on this particular job has a wheel diameter of 54¼" in double width construction. Shown here are a few of the smaller units in service.

Dependable equipment for making air your servant

CLARAGE FAN COMPANY

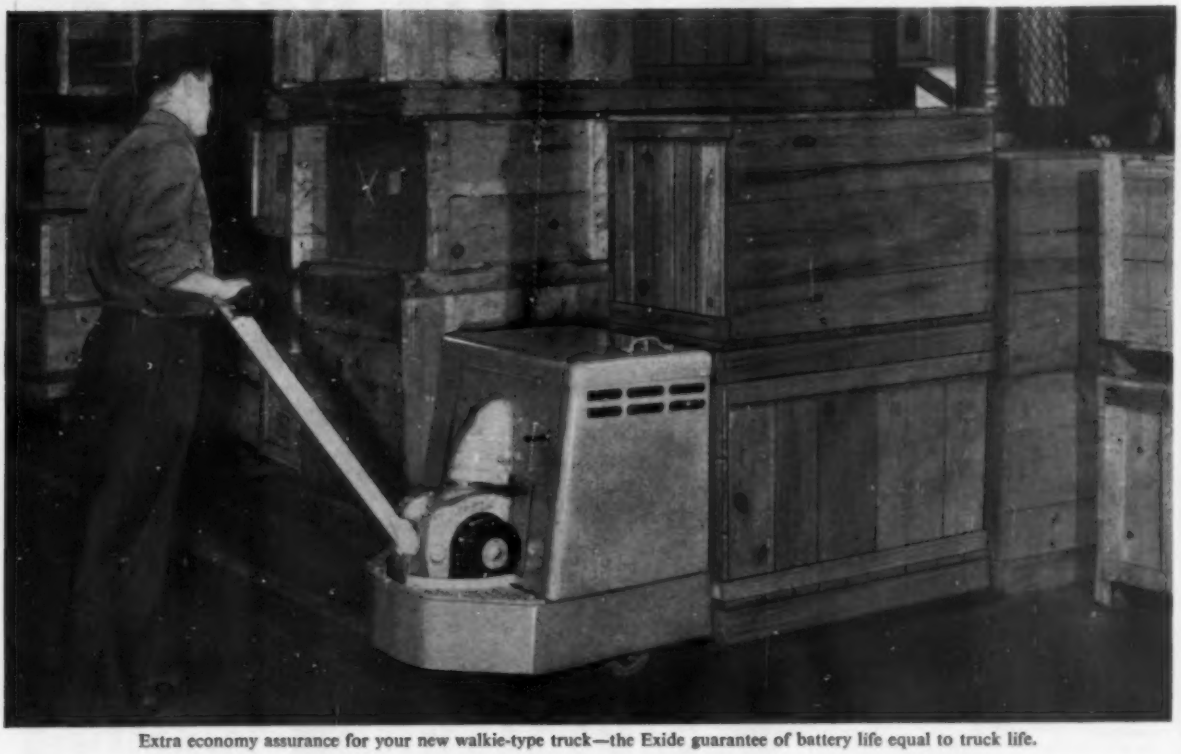
Kalamazoo, Michigan

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

Circle 561 on postcard, page 33

EXIDE POWER PACKAGE

Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.



Extra economy assurance for your new walkie-type truck—the Exide guarantee of battery life equal to truck life.

BATTERY GUARANTEED FOR LIFE OF TRUCK

Let's say you're about to buy a new walkie-type electric industrial truck. You want long battery life for maximum economy, and you don't want the nuisance of ever replacing the battery, if you can avoid it. Well, this is the Exide offer:

For walkie-type low lift trucks and hand tractors, the recommended Exide nickel-iron-alkaline battery (the type invented by Thomas A. Edison) is guaranteed for the life of the truck—provided the truck remains in your possession and approved maintenance procedures are followed.

The Exide Power Package. Recommended battery and charger from the world's broadest lines—plus factory-quality service to cover both.

This is not a reckless offer. Exide knows from countless actual performance records that these batteries readily give this kind of life. Many Exide nickel-iron-alkaline batteries have been used in walkie-truck service for upwards of 20 years and are still going strong. So the plain fact is that we are simply giving you positive assurance of battery value that is already there anyway.

Long life is one of the characteristics of Exide nickel-iron-alkaline batteries. They have other unique advantages too. They are lighter in weight than other batteries. They give off no corrosive fumes during use or while charging. And they can be stored indefinitely without injury. This is of special value during seasonal shutdowns or other inactive periods. All you do is discharge the battery, short-circuit the terminals and store in a clean, dry place.

Of course, for any type electric industrial truck—walkie, rider, or narrow-aisle—the maximum power economy depends on three factors: the right battery for the job, a charger to match, and needed service. This combination is the Exide Power Package.

Your Exide representative studies your requirements, then recommends the battery best for your needs from the broad Exide line. He is completely objective in determining your needs because Exide offers all types: Exide-Ironclad with tubular positive plates, Exide-Powerclad premium flat-plate, and Exide nickel-iron-alkaline. Exide chargers are available in both motor-generator and silicon rectifier types and in sizes to cover all needs. Exide service men are coast to coast, all factory trained on batteries and chargers.

The Exide Power Package is your easiest way to get not only maximum battery life in your applications, but maximum battery economy year after year. Write for details. Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

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Circle 562 on postcard, page 33

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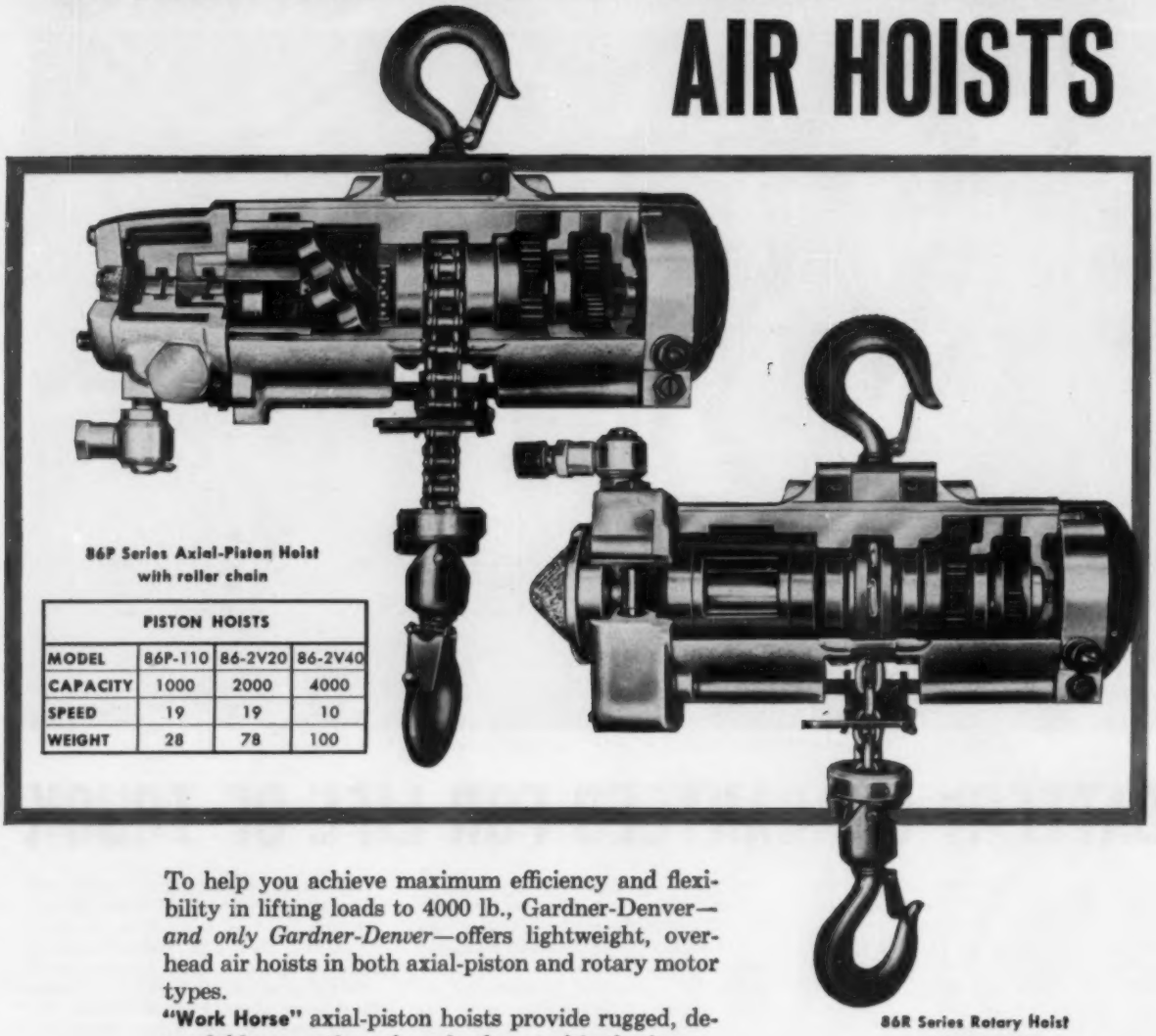

86P Series Axial-Piston Hoist with roller chain

PISTON HOISTS			
MODEL	86P-110	86-2V20	86-2V40
CAPACITY	1000	2000	4000
SPEED	19	19	10
WEIGHT	28	78	100

To help you achieve maximum efficiency and flexibility in lifting loads to 4000 lb., Gardner-Denver—*and only Gardner-Denver*—offers lightweight, overhead air hoists in both axial-piston and rotary motor types.

"Work Horse" axial-piston hoists provide rugged, dependable operation where load *control* is the important factor.

"Race Horse" rotary air hoists are designed for use where the combination of speed and ruggedness is the major consideration.

Both types provide variable speed, spark-resistant operation, powerful brake and precise control. Popular models available from 150- to 4000-lb. capacity.

86R Series Rotary Hoist with link chain

ROTARY HOISTS			
MODEL	86R-5	86R-10	86R-20
CAPACITY	500	1000	2000
SPEED	90	40	20
WEIGHT	27	27	30

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Circle 563 on postcard, page 33

how to control temperatures with gas unit heaters

Free from Reznor: "Commercial and Industrial Uses of Direct Gas-Fired Unit Heaters", fourth in Reznor's new series of Heating Handbooks, contains valuable information on how to choose the right heater to achieve and maintain desired temperatures in a wide variety of applications.

Reznor manufactures four heater series, each of which has a different control arrangement regulating the length of heating cycle and fluctuation from room temperature setting. Your choice depends upon the degree of comfort desired for the specific job.

Choose from: the Reznor Standard and Deluxe series, with controls designed for use in warehouses, storerooms and manufacturing plants; the Reznor Unitemp series, with sensitive low-voltage controls, for offices and restaurants; and the Reznor Flexitemp series, with low-voltage controls and automatically operated two-speed fan, for banks, libraries, and finer offices. Each series features eleven sizes. You may specify either propeller or centrifugal fan.

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Circle 564 on postcard, page 33

Watching Chips Fly. The high-speed end mill whirrs at 1500 rpm . . . chips fly . . . and the aluminum stock is milled to precision tolerances at the Union Twist Drill Company, Athol, Massachusetts . . . thanks to Strobotac.

Research with STROBOTAC

The new, white-light Strobotac is an important tool for studying the effect of geometry variations in cutting tools. Chip flow can readily be observed. "Stopping" the cutter with Strobotac enables a previously impossible view of the chip tool interface. If the chips are tearing from the milled surface, or are scraping the smooth surface in their escape, the prototype tool is redesigned to promote proper chip flow.

This is but one of the many uses for the Strobotac in dynamic testing at the Union Twist Drill Company.

Condensed Specifications for the instrument that will aid in the design and quality control of any type of rotating or reciprocating device.

Intense, White Light — more than 70 times brighter than previous model.

Extremely Short Duration Flash (1 to 3 μsec) — "freezes" motion; shows details heretofore impossible to see.

Measures Speed Directly — with better than ±1% accuracy to 25,000 rpm; useful to at least 250,000 rpm.

Long-Throw Beam — reaches into heart of complex machinery; made possible by new flash tube developed exclusively for this instrument.

Unique Carrying Case — provides protection and doubles as an adjustable stand. Patent No. 2,966,257

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Electronic Tachometer and Motion Analyzer . . . $260.

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Circle 565 on postcard, page 33

ASK THE MAN WHO CAN BUY ONE

In the not-so-long ago PLANT ENGINEERING published its first issue. It was dedicated to the proposition that the plant engineer was one of the most potent forces in industry—a force that was destined to become increasingly important as the natural evolution of industrial management took place.

Another straw of evidence that such importance has been achieved appeared the other night at an AIPE dinner. One of our old friends from Milwaukee (who may wish to remain nameless), stated that he had never seen such a rash of questionnaires, quizzes, popularity contests, and such like as he had in the past six months. To prove it, two days later he forwarded one of the later arrivals. Appended to it was the comment, "They want everything but my underwear size."

Now this isn't happening just to our friend from Milwaukee. We have received similar reports from all over the country. Frankly, we think it is flattering. Who wants your opinion on anything that has to do with the spending of money if you don't have any to spend? Remember Packard Motor Car's injunction, "Ask the man who owns one"?

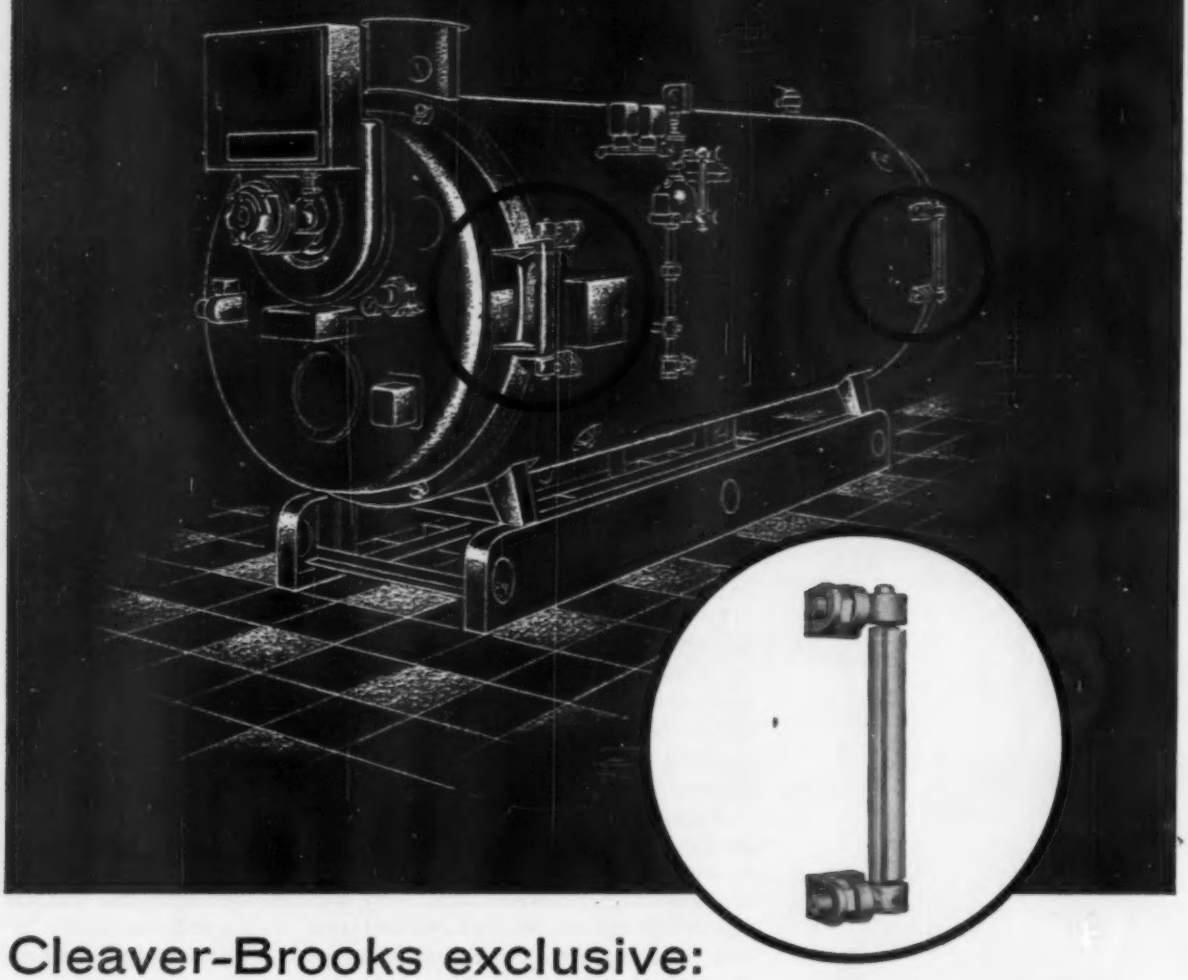
Belatedly, we must admit that we are among the culprits who flood you with questionnaires. The ever-increasing responsibility and authority of the plant engineer creates a changing pattern that is difficult to assess by means of plant calls, casual meetings at dinners, phone calls, written comments on articles, questions that arrive through the mail, inquiries and the many other hit-or-miss contacts that we have with readers.

Equally belatedly, we want to thank all of you, collectively, for having given so generously of your time—and patience—in replying to what must sometimes seem to be entirely irrelevant questions. We are almost sure, however, that every question the editors ask you has but one thought in mind . . . to find ways, means and reasons for letting plant engineers everywhere know what other plant engineers are thinking about, and doing.

One case in point is the questionnaire on automation and maintenance that some 1800 of you received last month. We believe the analysis of this questionnaire's findings will be of interest to a great many readers. There are many patterns emerging from the answers and these will be revealed in the January issue of PLANT ENGINEERING. We hope you'll watch for the analytical report, and read it.

Tom Hanson

Engineering Excellence stands out...



Cleaver-Brooks exclusive:

Patented hinged doors that open quickly, easily

Hinges for boiler heads are not alike. Some serve no useful purpose — they're merely window dressing.

The patented hinges found only on Cleaver-Brooks boilers are strictly of functional design. Both front and rear doors swing open quickly and easily — close again with little effort. There's no need to disconnect a lot of pipes, fuel and power lines every time you inspect the boiler. And the refractory swings clear of the tubes, too, because it's contained in the rear door.

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PERFORMANCE PROVES THE ENGINEERING EXCELLENCE OF CLEAVER-BROOKS BOILERS

Circle 566 on postcard, page 33

WHAT'S JUST AHEAD IN THIS ISSUE

- PLANT ENGINEERS are now considering fallout shelters in the design of their present or future facilities. Rohm and Haas engineers have been doing this since 1955 and are still doing it. They started with the Bristol, Pa., plant and are now planning underground areas for protection of plant personnel in their newest plants. The full story of what they are doing starts on the next page.

- WRAPPING NINE buildings around their production operations, E. D. Jones Co. consolidated their corporate facilities in a recently-completed plant. Pre-engineered steel buildings, with varying sizes and heights to suit the production needs of each area, were combined in the construction of the new facility. Turn to page 103.

- DUST, DUST and more dust—primarily sawdust from their woodworking operations—was a big problem at the Andersen Corporation until they installed a 17-in-1 dust collecting system. This multi-component system not only cleaned up the plant, but it is providing fuel for the plant boilers. For all the facts, see page 106.

- DESIGNING a vacuum system—or expect to be designing one? Beginning on page 108 you will find nomographs which can be of assistance to you and should help speed your calculations. With these graphs, you can quickly find such quantities as conductance, pressure drop and evacuation time for varying sets of conditions.

- INSTITUTING a cost improvement program for a maintenance function isn't easy. But, according to International Latex, if you go about the program in the right way, you can have some very interesting results. Their program works in three steps; to find out what they are and how they were used in setting up their program, turn to page 110.

- SMALL, but mighty, are the newly-introduced "midget" engines described on page 120. Small enough to hold in your hand, these two-cycle gasoline engines can put out ¾ hp to drive pumps, alternators for on-the-spot electric power, or even direct-drive an 8-in. circular saw.

- CONTINUED FUELING of a boiler in which a flame failure has occurred is dangerous—yet some boiler controls are susceptible to this type of "mistake." Beginning on page 123, the author describes an electronic control system, using an infra-red-detecting flame scanner and incorporating an interrupted pilot flame, that will safely monitor boiler operation.

- INCREASING the effective output of their compressors was the basic objective in a recent program initiated at an Owens-Illinois plant. With a combination of supercharging and precooling, they succeeded to the extent of 16 per cent improvement. In addition, the precooling removed objectionable water vapor. For the complete story, see page 132.

BLAST AND FALLOUT PROTECTION FOR AN INDUSTRIAL PLANT

Protection of personnel from nuclear blast and radioactive fallout is now recognized as a matter of major concern throughout our nation in both industry and individual families. Events during the past year have focused attention on the seriousness of this problem and the public is now showing an active interest in the recommendations that an effort be made to provide as good protection as is feasible against any kind of nuclear explosion.

By **LLOYD W. COVERT**
Vice President, Manufacturing
Rohm & Haas Company
Philadelphia, Pa.

THE Rohm & Haas Company took this problem more seriously than most several years ago and provided what were then—and still are—considered to be adequate personnel shelters at each of the plant locations. This was during 1956 and 1957.

Our experience with these shelters may be of interest to many other companies which are now seriously considering what type shelter should be provided. While it is probably impossible to build a shelter which offers 100 per cent protection in all circumstances, authorities agree that well designed shelters would very greatly reduce the loss of life in case of nuclear attack. It could well be that in most plant and suburban locations the loss of life would be reduced, with good shelters, to 5 or 10 per cent of the people from a figure of 90 or 95 per cent or even 100 per cent without some form of special shelter protection.

In 1955-6 Messrs. J. Bracegirdle, S. M. Cole, and H. R. Dunlap, under the direction of D. R. Merrill in our Bristol Engineering Department, made a thorough study of Federal Civil Defense Administration recommendations and worked out the design of the Bristol, Pa., shelter in consultation with FCDA authorities as well as others. The basis chosen for the design was to give full protection against blast and fallout from a 20-megaton "H" bomb at five miles distance.

Factors for load stress requirements were taken from the FCDA Bulletin M-25-1. The Civil Defense publication, TM-5-4, "Windowless Struc-

Loading and Stress Values of Bristol Shelter

Load Stresses on Roof

16 in. concrete roof	=	200 psf
2 ft earth cover	=	200 psf
Vertical downward blast loading	=	2000
Total vertical downward loading	=	2400

Vertical Upward Loads: (suction load on roof due to negative blast pressure)

Negative pressure	=	1000 psf
Less concrete, earth	=	400
Total vertical upward loading	=	600

(Note: Upward thrust on bottom slab caused by downward loading during blast has been taken as 2400 psf.)

Horizontal Loads on Exterior Walls

Horizontal blast pressure transmitted through ground	= 1000 psf
Earth pressure for depth of 10 ft (30 by 10 ft)	= 300 psf (at bottom only)
Total horizontal loading on walls	= 1300

Negative Load on Exterior Walls
Made approximately equal to positive load = 1400 psf

Allowable Design Stresses Used
(reinforcing steel)—40,000 psi (twice normal design basis)
(3000 lb concrete)—2,700 psi (twice normal design basis)

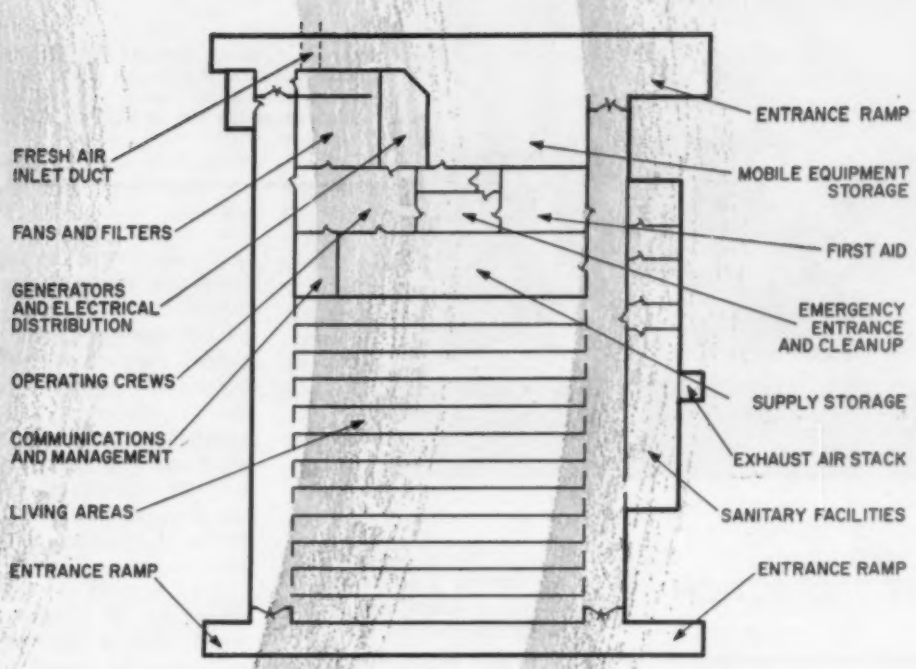


Fig. 1. Schematic plan of the various facilities provided in the personnel shelter at our Bristol, Pa., plant. This shelter accommodates 1700 persons.

tures," was also used in the engineering study. Since the shelter was designed with a flat reinforced concrete roof, stress factors for both downward blast pressure and upward suction pressure were important considerations. The loading and stress values used for the roof and side walls of the Bristol shelter are shown on the facing page.

The Bristol shelter was designed for a capacity of 1550 persons but now is equipped for 1700. The seating capacity is calculated at 19-in. seat width per person, with provisions for about 1050 to be seated at one time. The sleeping capacity—on 6 ft, 4 in. plywood bunks which are supported from the wall and ceiling —provides for approximately 650.

Thus, approximately 40 per cent of the occupants can be accommodated on the sleeping benches at one time. The net area per person in the personnel tubes is 5.3 sq ft. The area equivalent per person including the mechanical section, etc. is 7.0 sq ft.

The shelter is located as far as possible from sources of chemical contamination while remaining within the plant fence. It can be reached from the farthermost part of the plant in 10 minutes' walking time. The primary fresh air intake is located at the top of a 50-ft high stack, made of $\frac{7}{16}$-in. steel plate, which has been erected adjacent to the shelter. The stack is of self-supporting design, but it is also supplied with guy wires and anchors. The air inlet passages and air exhaust passages are protected by air check valves to minimize the effect of blast shock waves.

Two Sets of Filters

Fresh air taken into the shelter is filtered through two sets of filters to remove fallout particles and, if necessary, through activated charcoal and alumina to remove gaseous contaminants. Although all openings into the shelter are fitted with air-lock airtight doors, there is also provision for a slight positive pressure within the shelter to prevent unfiltered air from entering in the event of leakage. There is also provision for a secondary source of fresh air intake from the access tunnel direct to the plenum before the filters. This source has no protection from blast effects other than that which may be provided by the long underground tunnel which opens at ground level at either end.

The first of the two filters mentioned above is a prefilter made of glass wool cloth, which removes coarse particles, atmospheric dusts and other contaminants. It has a design efficiency of 95 per cent removal of particles based on the American Society of Heating and Ventilating Engineers' Code Method.

Following the prefilter, the air is passed through a high efficiency filter which is designed to remove 99.95 per cent of all particles down to 0.3 micron size.

Since this shelter is located at a chemical plant where quantities of ammonia, sulfur dioixide, and chlorine might be released in the event of damage to the manufacturing equipment, provision has been made for the reduction of these chemical contaminants. As a means to this end, the first step would be to reduce the intake from the stack from the maximum of 6.5 cfm per person to $1\frac{1}{3}$ cfm per person. This reduced air flow would then be passed through a series of four activated carbon filters and one impregnated activated alumina filter to absorb the toxic chemicals.

The Bristol shelter is located some distance away from the plant proper and the prevailing winds would normally be toward the plant rather than from the plant. It was not considered necessary to provide supplemental oxygen and CO_2 removal in this shelter, although this is now being reconsidered.

The Bridesburg (Philadelphia) shelter, on the other hand, is close to

Fig. 2. Outside view of the shelter ramp entrance. Air-intake stack is at right; directional radio antenna is mounted at the top of shelter stack.

BLAST AND FALLOUT PROTECTION

chemical operations, and facilities were therefore provided to supply oxygen, if necessary, for several hours from a bank of cylinders in the shelter. During such a time it would, of course, be necessary to remove CO_2 from the air in the shelter and facilities for this are provided by passage through soda lime.

Air Check, Exhaust Valves

In order to protect the filter banks and the inside of the shelter from the overpressure or underpressure accompanying an atomic blast, an air check valve has been installed in the base of the intake stack foundation and an exhaust check valve is in the pit below the exhaust stack. These valves are air-supported aluminum plates which are closed against a steel bottom plate normally, and also closed against a top steel plate under extreme air flow conditions. The exhaust air leaves the shelter through the toilet rooms and through the check valve, with a pressure drop of approximately 1 in., water gage. This pressure also maintains a seal against contaminated air at the doors and openings.

During warm weather occupancy, it becomes necessary to remove heat —approximately 400 Btu per person per hour—as well as considerable water vapor. This removal is provided by recirculating 13,000 cfm of shelter air through a separate set of activated carbon filters and through cooling coils operated on 60 F well water. This well water is thereafter used for engine-generator cooling and sanitary services.

Normal and standby electric power are available from the public utility, but emergency power can be supplied from either of two 50 kva gasoline engine-driven motor generator sets located in the engine room of the shelter. Battery-operated automatic emergency lights are located throughout the shelter to provide minimum lighting during changeovers or short periods of power failure. Selected locations within the shelter have standby lights always on for entry.

The anticipated water requirements are approximately 80 gpm for shelter cooling and dehumidifying; 10 gpm for engine cooling; and 10 gpm for personnel uses. Two deep wells are provided in the shelter area. One has a capacity of about 100 gpm and the other about 10 gpm. The major well is equipped with an electric driven well pump and the water is pumped directly and only to the shelter water system where it is first used for air cooling, then for engine cooling, and then for personnel waste disposal. Drinking water will be drawn by a similar pump from the smaller well, chemically treated and then dispensed by portable drinking water containers and paper cups.

Electrically heated hot water is available to one sink in the First Aid room.

The sanitary facilities include flush toilets in the women's rest rooms and chemical toilet pits for the men's room. Lavatories are provided for the women and group washing facilities for the men. The toilet facilities are connected to a septic tank sewer system, since no sanitary sewer facilities exist in the vicinity of the shelter. The septic tank drains by gravity to a land-locked lake on the plant property. Since the excess air from the shelter is exhausted through the chemical toilet pit, it provides a means of removing odors from the area.

Food supplies are stocked in the shelter for an occupancy of two weeks. Half of this food consists of such items as canned fruits, juices, soups, stews, vegetables, powdered milk, packaged crackers, and hard candy. It is withdrawn and used in the plant cafeterias at regular intervals to insure freshness. When it was decided to extend the food supply to two weeks, provisions for the second week were made in the form of dry multi-purpose vitamin-fortified products which have a long shelf life and can now be obtained in either powder or cracker form.

Disposable cups and spoons are provided as required. Empty cans and cups will be sprayed with a sanitizing solution and returned to the cartons for later disposal.

First Aid Room

One section of the shelter is equipped as a First Aid room. The plant nurse is assigned to this room. A limited supply of medical needs is stored in the shelter to care for conditions which may develop after occupancy. There is also provision to treat casualty cases which may occur at the time of the emergency. Special sleeping berths are provided in the First Aid room.

There is an emergency entrance to admit persons who might arrive after the regular entrance doors have been closed and who may have been exposed to radioactive fallout. Such persons would request admittance by a sound-powered telephone located

outside the emergency door. They would then enter an air-locked clean-up room equipped with a shower where they would discard their clothing and take a shower. Emergency clothing would then be provided.

A communication center within the shelter includes connections to the regular plant and public telephone systems; sound powered telephones to the blast tunnel outside the shelter; short wave Gonset radio on 144 megacycle band to Civil Defense authorities; short wave radio on 152.99 megacycle band to a number of special locations; and a radio receiver on broadcast band for public Civil Defense instruction. Antennas are located on the stack and on the ground. There are also tape recorder connections to the telephone for use if required, and the tape recorders can also be used to monitor radio equipment or other transmission of orders.

In this control room microfilm records of engineering drawings and plant procedures are stored. A printer is provided to reproduce these microfilmed records.

Two jeeps are kept in the tunnel entrance to the shelter. One is a pickup truck equipped for rescue and salvage work after the emergency. The other is a station wagon which will serve as a command car for plant management during the emergency period. Both vehicles are equipped with radio transmitter and receivers on a frequency of 152.99 megacycle.

Two 500-gpm fire pumps are located in the protected parking area. Three thousand feet of 2½-in. hose and one thousand feet of 1½-in. hose as well as a supply of fire-fighting tools are stored in the supply room. This equipment is sufficient to operate two independent fire-fighting squads. This equipment is also considered important for decontamination of plant areas.

Radiation Instruments on Hand

The shelter is supplied with radiation survey instruments for checking the security of the shelter during the fallout period and for surveying plant areas when the initial emergency is over. There are also integrating radiation dosimeters for use by rescue squads, firefighters or other emergency personnel who may have to leave the shelter for short periods.

A supply of paperbound books and various types of games are in the shelter to help provide diversion for the occupants. The shelter at the Bridesburg plant is equipped to "pipe" music through the shelter on a public address system. This type of equipment has not yet been installed in the Bristol shelter.

The Bristol shelter cost $424,000 in 1956, including engineering, construction, equipment, and supplies. A layout drawing of the shelter showing some of the principal features is provided in Fig. 1.

A picture of the shelter entrance, Fig. 2, shows the appearance of the top of the shelter from the outside. Figure 3 is an inside picture showing arrangement of the plywood bunks in the tunnels, which are separated from each other by concrete supporting walls.

As has been mentioned, Rohm & Haas has provided personnel shelters at each of its plant locations, large enough to hold the maximum number of employees who may be present at any one time. This is, of course, during the day shift. The basic design factors were the same for each shelter but details varied considerably since each of the plants handled the detailed engineering, using the

Fig. 3. This is a typical view of the personnel tubes, showing seating and bunking arrangements. These shelter tubes run in an east-west direction.

Fig. 4. At their Knoxville plant, Rohm & Haas combined a shelter and plant cafeteria into one structure. Scenic murals take the place of windows in this underground personnel shelter.

Bristol shelter and experience as a general guide.

The shelter at the Bridesburg (Philadelphia) plant is about the same size as the one at Bristol and it was built in 1957 at a cost of $405,000. It was built with the entrance adjacent to the plant gatehouse and is a reinforced concrete structure underneath a parking area. One major difference between the two is that the Bridesburg shelter does not have standby vehicles and the entrance is therefore simplified. It provides independent water, electric power, air filtration, and other equipment quite similar to the facilities of the Bristol shelter.

At our Houston and Knoxville plants, the number of people concerned is considerably less and it was considered feasible in both instances to build the shelter in such a way that it could also be used as a cafeteria. This was done and it has worked out very satisfactorily. The same factors were again used with respect to the degree of protection to plant personnel against blast and fallout.

Shelter-Cafeteria Combination

The Knoxville shelter-cafeteria is a basement section under a new warehouse. The Houston shelter-cafeteria is a basement section under a plant laboratory. The Knoxville shelter supplies food largely through vending machines. At Houston there is a normal type kitchen provided above the shelter and food is lowered to the serving area by means of dumbwaiters. The inside of both shelters is made pleasing through the use of lighted murals of mountain and skyline scenes. This has proved quite successful in removing any feeling of being in an underground chamber. These shelters are well lighted and the ceilings are of acoustical tile. An inside picture of the Knoxville shelter, which can accommodate 480 persons, is shown in Fig. 4.

Rohm & Haas expects to be operating at three additional locations within the next two years. One of these is a new plant at Louisville, scheduled for operation in 1962; another is a new research facility at a suburban Philadelphia location and will probably be occupied in 1963; and the third is a new central office building in Philadelphia which is being planned. This requires the consideration of shelters for each of these new locations and design work is now under way.

The shelter for the new office building will be a reinforced concrete basement section and although this will be fitted out as completely as is practical for a center city location, it is perhaps impossible to provide as good protection as can be installed at the plants or in a suburban location.

New Design Planned

The first new shelter required will be at Louisville. A quite different type of design for this is being worked out by G. W. Asay and J. H. Geniesse of our Bristol Engineering Department, based on using standard corrugated steel arch sections bolted together, supported on a reinforced concrete base protected on the top and sides with earth fill. A special entrance must, of course, be provided.

This design scheme eliminates the need for a considerable amount of reinforced concrete and we believe is a very practical type shelter to build when sufficient ground area is available, and when the number of people involved is not too large. It is of interest to note that such a shelter can be easily designed to give a higher degree of protection against blast and radiation than is provided in the Bristol shelter just described.

The personnel portion of this shelter is 14 ft wide by 8 ft 2 in. high, utilizing a 15 ft by 6 ft No. 8 gage 6-in. by 2-in. corrugated steel arch and will provide radiation and blast protection from a 20-megaton bomb at two miles (equivalent to 3600 psf). It has a factor of safety of 1.75 when the crown of the arch is at or below grade and covered with 36 in. of earth and supported by an adequate foundation and floor system. This design will provide a living area of 10 sq ft and 78 cu ft per person including space for food provisions and medical supplies for a two-week period.

More Space in New Shelter

The necessary radiation removal and chemical filters, ventilation fans, electrical generators, well, pumps, water storage, water heater, tools, and decontamination area will be provided in an extension of the same type of arch construction. This shelter is designed to provide more living space per person than the Bristol shelter; namely, 6.3 sq ft per person in the personnel section, compared with 5.3.

The total area in the shelter planned for Louisville including the mechanical section is 13.7 sq ft/person compared with 7.0 for Bristol. In part, this points out the necessity to use a larger proportion of space in a small shelter for mechanical equipment and general purposes. It will be noted that the above arch type design will provide against about twice as much blast pressure effect as would the Bristol shelter.

This mechanical equipment is being sized for future expansion of the personnel tube to accommodate an additional 150 people. Protected ramp entrances will be provided at each end of the 150-ft long shelter. We believe that this basic design is quite flexible and can be adapted to various plant site areas because expansion of the personnel tube can be arranged in parallel, radial or intersecting configurations.

The shelter required at the new laboratory site will be larger than that at Louisville, and will accommodate about 600 persons. It is being designed on a basis similar to that for the Louisville plant. In this case it is planned to use one side of the tubular personnel shelter to carry utility lines between buildings and thus, to that extent, serve a dual purpose. **End**

Fig. 1. Timers turn off lights in this large office area after working hours.

AUTOMATIC TURNOFF REDUCES LIGHTING COSTS

By **HAROLD J. THALHEIMER**, Facilities Plant Engineering
General Electric Company, Cincinnati, Ohio

SAVINGS in lighting costs estimated to be around $30,000 per year are being realized by the Large Jet Engine Department of General Electric Company, Evendale, Ohio, as a result of a change in the design of lighting circuits. Simply stated, the change consists of providing equipment and circuits that will automatically turn off all lights in the office area at the end of the working day.

This simple idea was conceived during the planning stages of an office renovation program for the largest office area in the plant. Covering approximately 175,000 sq ft of floor area, this office provides space for about 2000 employees.

Prior to the new installation, light switches were located in lighting panels uniformly spaced throughout the area. Repeated campaigns by management to get lights turned off at the end of the working day were partially effective, but, in time, failed due to the problems of getting cooperation from the many employees involved.

Some of the usual reasons given for failing to turn out lights were that the light panels were located outside of convenient access to all office functions and in many cases considerable travel through and around other partitioned office areas was involved. In addition to this, it was difficult to identify switches controlling lights over a specific area and in some cases lights on a particular switch overlapped into adjacent areas.

Janitors frequently forgot to turn off the lights when they finished night cleaning. Employees staying late and maintenance personnel always expected someone else to turn off lights with the result that they usually burned most of the night.

Utilizing the existing lighting panels and circuits, the renovated lighting system includes an additional in-

AUTOMATIC TURNOFF REDUCES LIGHTING COSTS

expensive low voltage automatic turnoff feature. An automatic timing device sweeps off all of the lights in the entire area by energizing low voltage relays installed at each lighting panel. The lights are manually turned back on at low voltage switch stations located at frequent intervals throughout the office area.

Here is how the system works. Normal office working hours are from 7:45 A. M. to 4:30 P. M. At 5:30 P. M., all of the lights except night lights are automatically switched off. Anyone desiring to stay, turns the lights on over his particular area at the low voltage switch station nearby.

At 7:30 P. M., 9:30 P. M. and 12:00 midnight, the lights are automatically switched off again. This turns off any lights left on by employees staying late, maintenance men or janitors. When employees arrive at work in the morning, they turn the lights on over their respective areas at the local switch stations, saving considerable walking time.

System Really Works

One of the important advantages of this system is that it works. Getting the lights turned off does not rely on the unpredictable human element. When the time comes for the lights to go out, they go out. Setting the timing device to switch off the lights again at spaced intervals insures that any lights that are turned back on again will be switched off. These timed intervals must be set to suit the needs of office operations.

With this system, savings are being realized through reduction in consumption of electrical energy and the cost of lamps by extending lamp life. Due to shorter burning hours, there is also a reduction in the cost of ballast and starter replacements in the fixtures. An additional savings is made in air conditioning costs formerly needed to offset lighting heat.

After one year of operation, maintenance on the new system has been relatively minor, consisting only of replacement of several low voltage relays and switches. Since the completion of this installation, the automatic turnoff feature has been incorporated into the design of another new office area of 35,000 sq ft with results that were equally successful. **End**

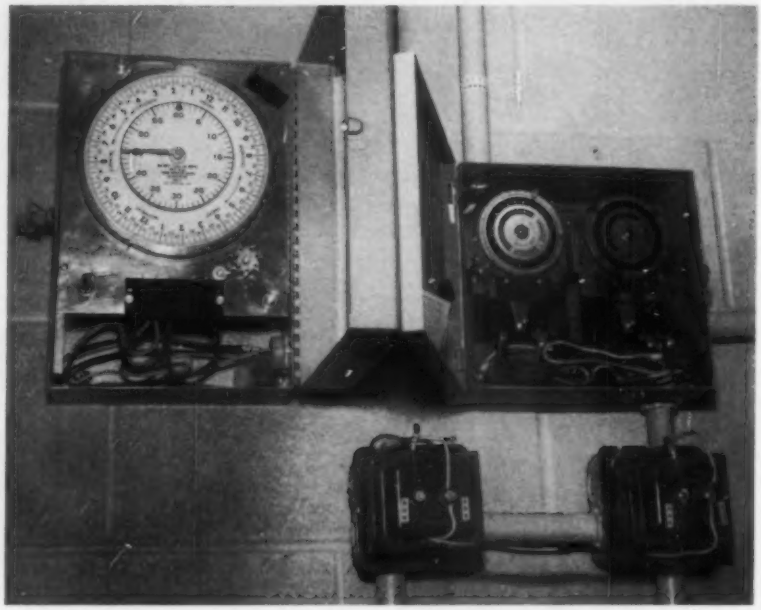


Fig. 2, above. Automatic timing device, shown at left, turns off all office lights at pre-set intervals. Timers at right turn off air conditioning system.

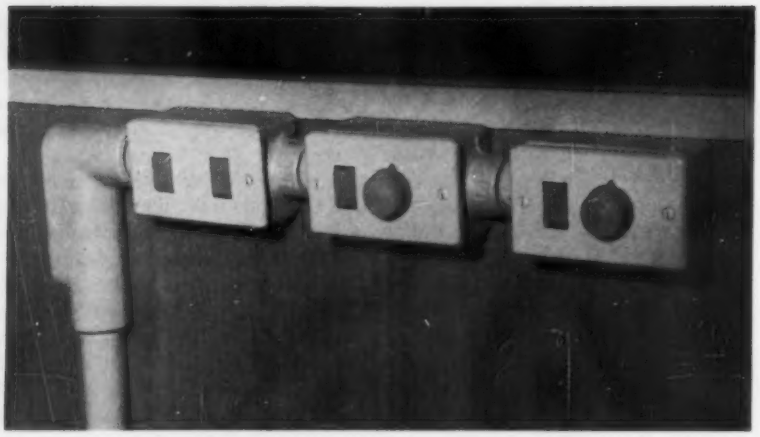
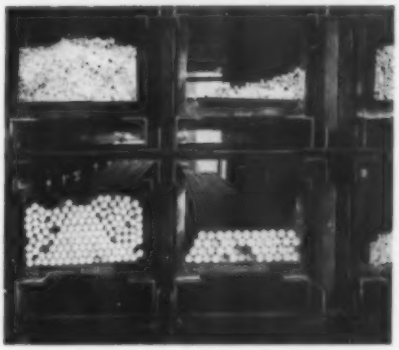


Fig. 3, left. Conveniently located low-voltage switch stations permit lights to be controlled manually.

Operator inserts truck's steel tongue into portable bin, removing the necessary stock to fill an order.



Closeup of the storage area shows how the portable bins are constructed.

BIN-RACK SYSTEM SPEEDS SELECTION OF BAR STOCK

A NEW materials handling system which has been designed by and put in use at Gageline Steel Corporation in Chicago has so speeded up their operation that now a complete physical inventory of three million pounds of bar stock can be made in eight hours.

One of the first warehouses with facilities and services designed to serve the metal-bar-using industry exclusively, they offer as standard items bar stock with eight micro-inch finishes and with tolerances to 0.0003 in. It thus became necessary to devise a handling and storing system that would insure complete protection of this accuracy stock at all times.

When the stock comes into the warehouse from the mill it is weighed, inspected for accuracy, finish, straightness and roundness. It is then put into a specially developed portable bin, 12 ft in length with a capacity of up to 3000 lb, that is lined with wooden strips which protect the finishes. A fork lift truck with a reinforced steel tongue carries it to the storage area.

Here the bins are supported by a rack structure which is built in honeycomb fashion. Any bin can be removed easily from the rack without having to move other bins. A 24-ft aisle separates the two racks, which allows adequate space to maneuver the fork truck.

The bins are operated in a random access manner. A main card file is organized first by grade of metal and second by size. Since each bin weighs 210 lb, the warehouseman does not have to be concerned with the weight of the bins while he is checking materials in or out.

To fill an order, the clerk locates the grade of metal and size from the files. Listed are all the bins containing a given size and grade of stock. He then relates to the warehouseman only two facts: how much material to remove and the bin number.

With the order ticket the warehouseman pulls the specific bin with his fork truck and moves it to the recording scale. After filling an order the scale ticket is returned to the office for verification.

With this system it is possible for one man to operate the entire warehouse. This system can be used by any plant which must store long lengths of stock. To many it offers a method of reducing costs. **End**

Fig. 1. Proximity switch usually consists of sensing and control element.

Fig. 2. Proximity switch senses pipe when it reaches end of conveyor table.

STATIC AUXILIARY DEVICES BOOST CONTROL RELIABILITY

By **CHARLES J. MANNER**, District Engineering Department
Westinghouse Electric Corporation, Salt Lake City, Utah

DEVELOPMENT of static magnetic control has provided highly reliable logic systems that can accept information from many sources, store and coordinate data, and deliver an operating signal at the correct time and place. Full development and ultimate use of static controls may be limited by the availability of suitable devices designed to match the high standards of performance established by the static logic system.

Control signals or logic inputs that originate as electrical quantities such as voltage and current are relatively easy to accommodate. However, input signals that originate as physical quantities such as position, speed, temperature, time, or as chemical analytical quantities require a transducer, detector or analyzer to convert them to a usable electrical signal.

In the field of industrial automation, the most common auxiliary device is a position detector or limit switch. Programming of machines or automatic handling of materials requires position measurements to sequence the control from step to step and to locate the position of material being processed. The control system would be blind or out-of-touch with the work if it lacked the control sense of position.

Proximity limit switches can detect the position of ferrous materials

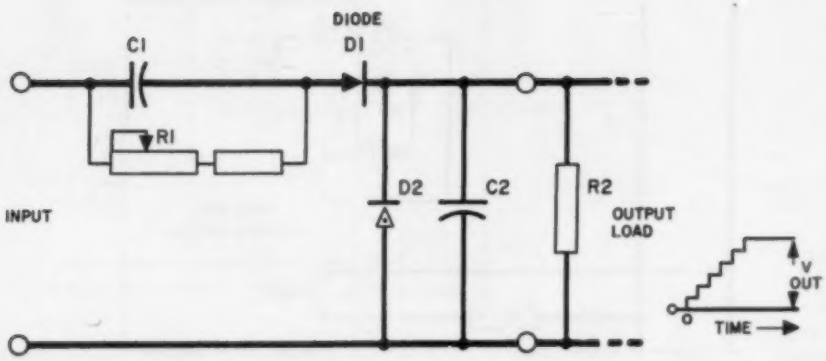


Fig. 3. Some static timers use charging rate of capacitor to determine time measurement.

without making mechanical contact with the material. The proximity switch usually consists of a small protected sensing element and a control element, Fig. 1.

Sensing units are usually mounted so that the machine part or material will enter the sensing zone and thus indicate the position of the actuator relative to the sensing unit. The control unit may be mounted at any convenient distance from the sensing element and is usually mounted in the control cubicle.

In the Cypak proximity limit switch the control unit consists of a balance adjusting device, an amplifier, phase detector, a precision flip-flop circuit, transistor and fused power supply. True electrical snap action is provided by a variable reluctance bridge-type sensing circuit.

When magnetic or ferrous material is brought within the operating zone of the sensing element, the reluctance bridge becomes unbalanced. The control unit converts this signal to a true digital output of sufficient power to operate an eight watt, 24-volt relay or a small solenoid valve. An output signal is also provided so that completely static position detection is accomplished.

This proximity switch is basically a momentary contact device. Maintained contact performance may be obtained either by using a long operating flag or by using a MEMORY module in the output circuitry. Operating time for this proximity switch is approximately 25 milliseconds. It will follow 20 operations per second when used for counting applications.

If the actuator moves at high speed, commonly found in hoist or elevator applications, it must be long enough to hold the control element "on" for the time required for other control functions to be accomplished.

As an example, let us assume an "on" time requirement of 0.1 second and an actuator speed of 20 ft per second. The proximity switch needs 0.025 sec operating time or a total actuator time of 0.125 sec. The actuator must therefore be 20 times 0.125 or 2.5 ft long.

As it takes 0.025 sec for the switch to operate, the sensing element must lead its static operating position by 20 times 0.025 or 0.5 ft. This six inches is the distance the actuator travels during the response time of the control unit.

If the proximity switch is to be actuated by a heavy product, it is well to provide a mounting bracket that will shield the sensing head from accidental impact. A typical mounting for a proximity switch sensor used in a large diameter pipe mill is shown in Fig. 2. The bracket is easily adjusted and protects the sensing element from being destroyed should a pipe not ride properly in the conveyor.

The proximity switch is used to stop the pipe conveyor when the end of the pipe reaches the sensing head. It also initiates the succeeding sequence to transfer the pipe to another operation.

Measurement of time is perhaps just as important as measurement of position. In fact, a good timer may be used in place of position measurements when speed is defined. A timer may even provide a more satisfactory signal, particularly where the use of a limit switch is more costly or difficult. As an auxiliary device to the logic control system, the static timer is indispensable.

Static timers usually operate on the energy storage principle and use either a capacitor or an inductor as a storage element. Either scheme operates much like filling or emptying a bucket of water. Time is a function of quantity and flow.

A two-gallon bucket filled at the

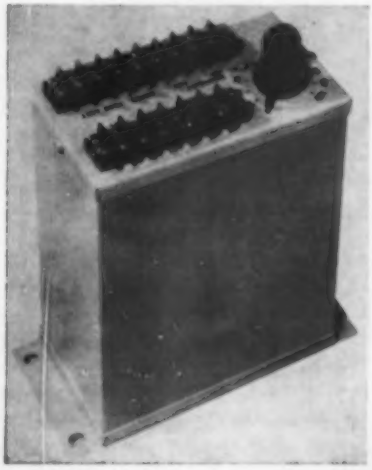


Fig. 4. Sensitive static relay converts an analog signal to "on-off" or digital signal.

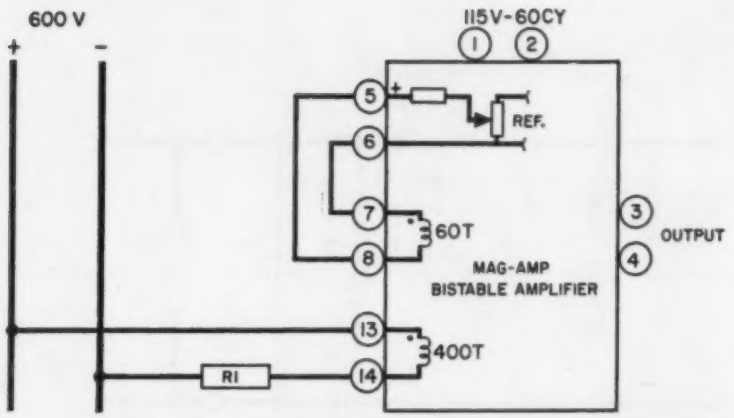


Fig. 5. Typical arrangement for measuring d-c potential. Control point can be set by turning reference potentiometer on case. Provides five watt output.

rate of one gallon per minute requires two minutes to receive a full charge. If the full bucket should spring a small leak of $\frac{1}{10}$ of a gallon per minute, the two gallons would be gone in 20 minutes. We can see that time can be established by the combination of capacity and rate of flow.

Standard Cypak timers use the charging time of a capacitor to determine time measurement. The charging rate is controlled by a capacitor voltage divider, Fig. 3. A small charge is transferred to the large capacitor C2 on each positive half cycle of the 60 cycle power supply. Total time is controlled by adjusting the size of each of these small charges.

A positive half wave 60 cycle voltage is used to supply the input power to the timer. The RC circuit formed by R1 and C1 will hold a charge determined by the setting of R1. Capacitor C2 is large and discharges slowly through R2.

Reverse discharging of the large capacitor is blocked by the diode D1. On the first half cycle the pulse divides between the two capacitors C1 and C2. The charge on C2 remains, but the charge on C1 decays as determined by the setting of R1.

Since the C1 charge blocks the charging of C2, a high resistance setting of R1 causes a larger C1 charge and therefore a longer time delay. On succeeding half cycles, a controlled charge is added to C2. This action is repeated each half cycle increasing the charge on C2 in a stair step fashion.

Time Delay Circuit

Eventually the charge rises high enough to switch a MEMORY logic element connected to the timer output. If a short time delay is required, the blocking charge on C1 can be reduced by reducing the resistance of R1, which means that C2 will be filled in fewer charging cycles. The Zener diode D2 is used to limit the charge on C2 to a moderate value above that actually required. Resistor R1 is an externally mounted rheostat and is used to set the time value.

Time range is established by the size of C2. Four modules are available with maximum time ranges of one second, three seconds, 10 seconds and 20 seconds. Minimum delay is approximately one-fifth of maximum delay. Complete reset is accomplished in 100 per cent or less of the maximum time rating.

A special fast reset static timer has been developed for applications where the slow resetting of standard modules is objectionable. In this module, operation is reversed. It is charged in a few cycles from the output of a preamp module and the decay time is used for timing. Timing adjustment is obtained by loading the time delay capacitor with an adjustable resistor so that the time can be reduced as required.

With this system a static timer is obtained with almost instantaneous reset action. In addition, the maximum time is increased to 90 seconds and is adjustable over a 10 to 1 range. This advantage is gained at a higher cost due to the special components used and the need for an input preamp.

Frequently, control signals are high energy electrical quantities available from sources such as current transformers, potential transformers or d-c voltage dividers. There are also many low energy signals such as the output of a d-c ammeter shunt, a Hall generator, a conductivity cell, pressure transducer or thermocouple.

In original form, these signals are unsuitable as input signals for static control. They are analog quantities instead of digital and the voltage level will usually be either too high or too low.

An accurate decision-making device is needed to convert these analog quantities to an "on-off" or digital signal at the precise level of the analog signal. This device should be capable of switching from the "on" to the "off" state with a minimum of change in the analog quantity.

Static Switch

To solve this problem Westinghouse developed an ultra-sensitive static relay called the MagAmp Bistable magnetic amplifier, Fig. 4. Complete isolation is achieved between signal sources and amplifier output since the signal is applied to a fully insulated control winding on the magnetic amplifier. Four isolated control windings with 10, 60, 60 and 400 turns are provided. Due to the sensitivity of the amplifier and the selection of control windings, signals as low as 0.4 millivolts will drive the amplifier from "off" to "on."

An optional internally regulated reference is available that may be connected externally to one of the control windings in order to bias the operating point away from zero. The bias may be as large as 1000 times the bandwidth so that a switching sensitivity of 0.1 per cent is available.

As an example, if the Bi-stable amplifier were applied to a 600 volt d-c potential, a change of 0.6 volts would switch the output "on" or "off." A typical arrangement for measuring

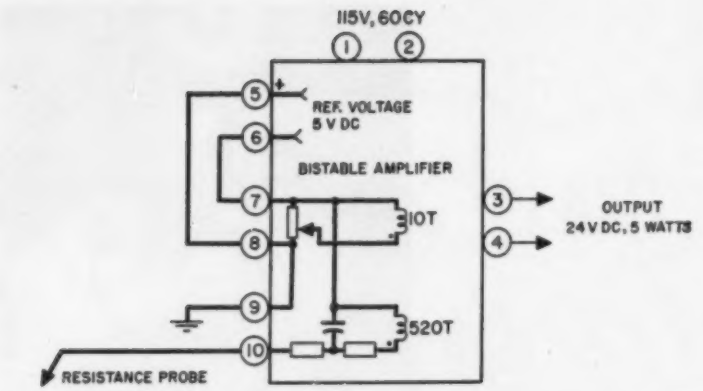


Fig. 6. Input modifications needed to make amplifier suitable for use as a resistance detector. Probe resistance of several megohms can be detected.

d-c potential and providing an adjustable control point is shown in Fig. 5. The control point can be set by turning the reference potentiometer on the case.

The amplifier provides an output of five watts at 24 volts d-c and may be used to operate a relay, magnetic amplifier or solenoid valve. With an output voltage divider, it is suitable for use as a Cypak control input signal.

Although this amplifier is strictly an "on"-"off" device, it may be used as a proportional amplifier. If the output feeds a magnetic amplifier or saturable core reactor of relatively long time constant, the Bi-stable amplifier will automatically divide the "on" and "off" time in proportion to the error signal in the closed loop regulator system.

The high sensitivity and stability of this amplifier makes it particularly well suited as a resistance detector. In the automatic handling of certain bulk materials containing a small percentage of moisture, the resistance of the material may be used as a means of level detection. An electric probe may be mounted so that the material will engage the probe and complete an electrical circuit by high resistance contact.

Level Control

A probe circuit resistance of several megohms can be detected. Figure 6 shows the input modifications needed to make the amplifier suitable for use as a resistance detector. By using the five volt d-c internal reference as both a bias and a probe power supply, the probe voltage is limited to five volts d-c and an adjustable sensitivity of approximately three megohms is achieved. Proportionately high resistance sensing can be obtained by using a separate probe potential of higher voltage.

Since the amplifier will operate on either an a-c or d-c input, a shunting capacitor is used in the probe circuit to bypass induced a-c voltage. This circuit then responds essentially to d-c resistance, and long probe leads can be used without trouble from stray 60 cycle induction or capacitance pickup.

When reliability, environment or maintenance costs justify the application of static output devices, a completely contact-free control and power system can be assembled. The standard Cypak MagAmp is used as an output device and is designed for good voltage regulation in order to handle the high inrush encountered in operating a-c contactors and large solenoid valves. An internal feedback arrangement in these special amplifiers permits momentary overloads as large as four times the continuous load rating with essentially 100 per cent output voltage.

A motor can be controlled by saturable core reactors, thereby eliminating the power contacts. In order to get the motor to stop at no load, the reactor is designed to have a very small leakage current at cut-off and the reactors must have low exciting current.

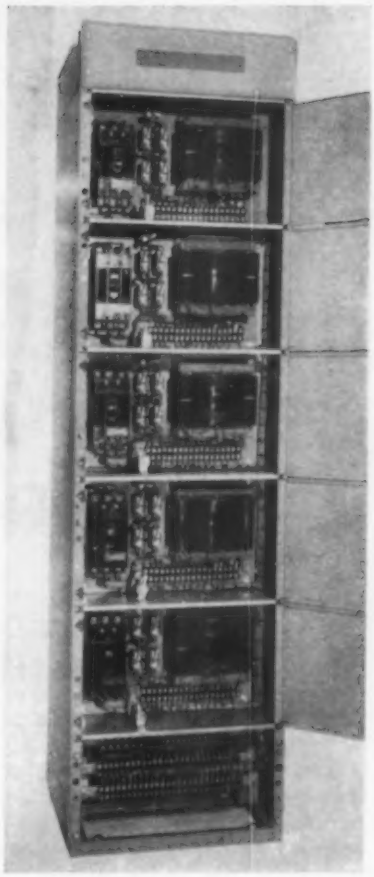


Fig. 7. Static starters used for controlling 2-hp motors are designed to develop 125 to 150 per cent torque.

Static Motor Starter

Use of saturable core reactors will reduce the terminal voltage somewhat below the line voltage during starting. Therefore, if high starting torque is required, a Nema D high torque motor should be selected for the drive. Since static starting also infers frequent starting, the use of the Nema D motor may also be indicated by the motor duty cycle.

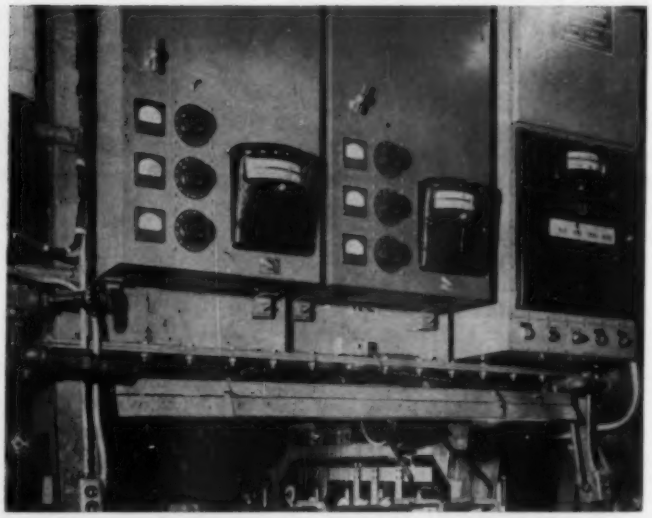
Static starters used for controlling conveyor motors are shown in Fig. 7. Each starter controls two 2-hp, 440 volt, 60 cycle gear motors. The starters are designed to permit the motors to develop 125 to 150 per cent starting torque and will stop the motors promptly at no load. A saturable core reactor is shown at the right in each of the five starter cubicles. Two similar reactors are mounted on the back plate in each cubicle. **End**

CONTROL CHANGE REDUCES OVEN WARMUP BY 36 PER CENT

Modulating reactor controls boosted the capacity of the baking oven 50 per cent.

ALL MANUAL manipulation was eliminated and an 11-hour oven warmup period was reduced to seven hours as the result of a change to modulating reactor controls on the magnet wire coating bake ovens at the Chicago plant of Belden Manufacturing Company. It had been necessary to devote constant attention to the heat control settings on the ovens in order to reach and hold a desired temperature profile.

Originally only a fourth of the heating elements were controlled, with the balance being switched on and off manually to alter the oven profile when product changeover was made to another wire gage, a different type of varnish or when more or fewer coats of varnish were to be applied.



The 11 hours required for this 120-strand varnish baking oven to reach profile was reduced by four hours with automatic regulation.

These baking ovens are approximately 5 ft wide by 6 ft deep, with heating elements occupying 1 in. on each face of the oven—thus, leaving a product and clearance space of only 4 in. Oven temperatures required by different wire gages and coating specifications range from 450 to 800 F, with 500 to 550 F as the most common setting.

The chimney effect inside the oven produces a flow of 375 to 400 scfm of air which serves as oven exhaust. The amount of volatiles evaporated varies greatly with the wire and coating but an average is in the magnitude of 5 gph for No. 16 to No. 19 wire.

As for heating, each of the oven's six element sections is equipped with a variable voltage transformer wired in series with a magnetic amplifier which adjusts the circuit voltage to the 15 kw reactors. Four 110 v elements are connected in series on a nominal 440 v line.

With their selection of an improved control system, Belden utilized instrumentation supplied by Barber-Colman Company, Wheelco Industrial Instruments Division of Rockford, Illinois. Specific results that have been attained include: an improved oven response; a reduction of manhours required for manual element-bank switching during startup and changeover; an improvement in product quality and a reduced number of hot spots inside the oven resulting from uncontrolled elements.

An important bonus gained by the new control installation was an increase in the thermal capacity of the ovens. With the old system the capacity was 45 kw and 60 kw compared to their present rated capacity of 67.6 kw and 83.6 kw, respectively. This sizable upgrading of 50 and 40 per cent respectively was made possible by installing larger elements with fully automatic modulating controls. **End**

NINE-BUILDING PLANT

Fig. 1. Aerial view of E. D. Jones plant highlights use of nine steel buildings of various sizes, lengths.

PUTS ONE ROOF OVER COMPANY OPERATIONS

TO CONSOLIDATE under one roof, provide built-in expandability and reduce material handling costs, E. D. Jones Corporation, Pittsfield, Massachusetts, relocated its manufacturing and administration into an impressive new plant. Ten separate facilities have been combined into a single structure; these scattered facilities had presented problems of materials handling, communication and warehousing functions—even corporate activities were scattered throughout 17 different levels in the organization.

The 200,000-sq ft facility, composed of pre-engineered building units, was designed by engineers from Jones—and from its parent company, Beloit Iron Works—to untangle this complicated pattern of manufacturing. In addition, its design permits expansion, when it is deemed necessary, to a total of 640,000 sq ft of floor area, with a minimum of disruption to plant operations.

The building stands on ground that was once a commercial gravel bed. About 1300 yards of concrete were used in the building foundations, including spread footings that had to be put down as far as 12 ft to get below the gravel deposit. Over 3000 yards of concrete were poured in the floors; 1000 yards went into machine foundations.

Pre-engineered steel buildings, sup-

Fig. 2. Here, manufacturing bay joins erection bay at right angle. Cranes overlap for two-bay coverage.

plied by Armco Drainage & Metal Products, were selected for several reasons. One principal reason is that they reduce problems and costs of future expansion. It will, for example, be possible to remove exterior walls and re-install them as parts of a new addition when the plant is enlarged. This operation generally can be done without temporary shoring to support the existing structure. The estimated loss of material will be marginal, if any.

Another factor which influenced the choice is that these building units could provide a wide range of bay widths and heights to fit specific plant needs. The nature of production did not warrant the same height for the receiving, manufacturing and erection bays.

Steel building construction enabled the plant designers to tailor roof heights to what was needed for efficient operation of each bay. Fifteen overhead cranes, ranging in capacity from three to twenty tons, had to be incorporated into the design and function of the various bays. For example, the overhead crane runway in the erection bay was elevated to permit riding above the overhead cranes leading in from the fabricating and machine shops.

Varying Sizes Pay Off

Because of the varying roof heights, the company not only realized an economy in the use of structurals, but even more important, it has substantially reduced the cubage to be heated. With the exception of the two smallest, all units are truss-type buildings. They range in widths from 20 to 100 ft and from 100 ft to 400 ft in length. Clear heights under the truss range from 12 to 40 ft.

Above all, one of the most rewarding features was the speed with which the plant was erected and put into operation. From the date that ground was broken for the new plant, only nine and one-half months elapsed before the move into the buildings was completed.

Of the over-all 200,000 sq ft available at the present time, the 120 by 314-ft office section covers approximately 40,000 sq ft. Here, executive, sales, personnel, accounting, dispensary, engineering, drafting and other administrative offices are housed. The area is completely free of columns, permitting ready re-arrangement of spaces by means of movable partitions. Electrical and telephone services are flexible, too, with a grid of conduits in the floor.

The plant portion, covering 160,000 sq ft, is laid out to provide a steady production flow, in a U-shaped pattern. A 3500-ft-long rail spur branches into the receiving and shipping bays of the new plant. These two bays are at opposite ends of the three-bay manufacturing area.

Immediately off the office section is the 60 by 400-ft receiving and storage bay; a rail line and two truck docks are on the south side of this bay. Two overhead cranes, with 10- and 5-ton capacities, service the receiving facilities.

First of the three manufacturing buildings houses fabricating bays where steel plates are shaped. The weld shop is also in this 100 by 300-ft building. One heavy-duty 10-ton, center-cab overhead crane spans the northern 50-ft bay of this building, while three 3-ton traveling cranes span the other 50-ft bay. Fabricated parts move toward the erection bay.

Machining Bay

Also 100 by 300 ft, the central manufacturing building is for heavy and medium machining; it houses horizontal and vertical boring machines, milling machines and large lathes. The two 50-ft bays are serviced by one 20-ton heavy-duty end-cab and two 5 and 10-ton travel-lift cranes, respectively. Small castings are handled by jib cranes.

Similar in dimensions to the first two, the third unit has several functions; one half houses equipment for lighting machining, the other is used for small parts storage, a tool room, the maintenance department and control panel manufacturing. Three 3-

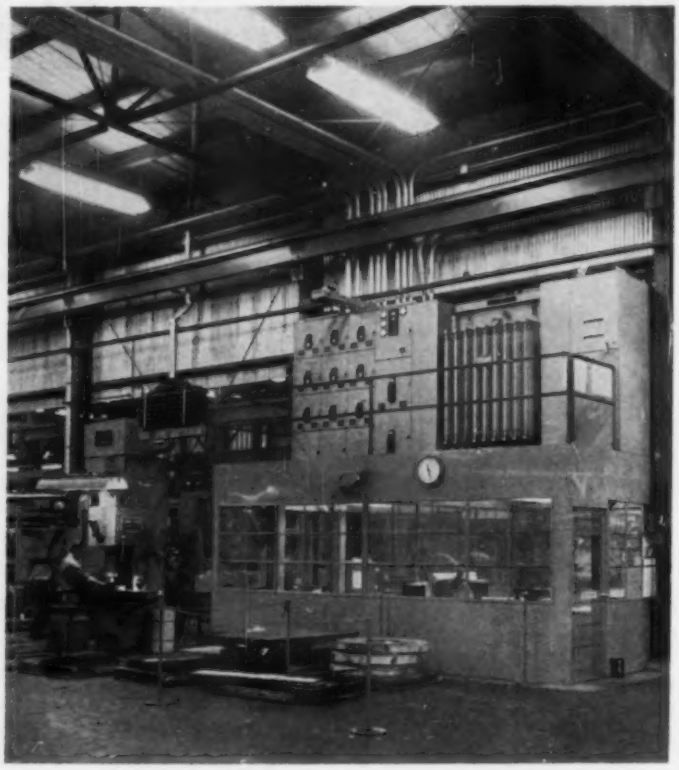


Fig. 3. Steel-walled supervisor's offices on plant floor, under transformer bank platforms.

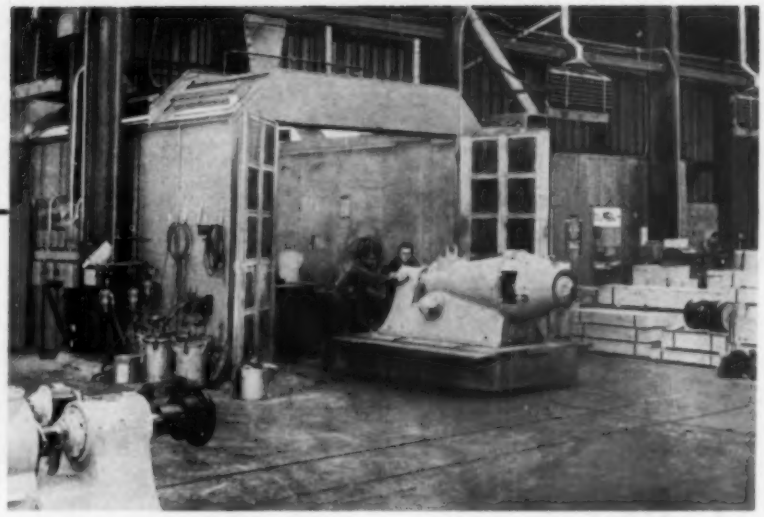


Fig. 4. Plant spray booth is integrated into structure. Gas-fired radiant heaters are vented to roof.

ton top-run overhead cranes span the machining bay to service the many activities.

All three manufacturing bays empty into an erection or assembly shop, 400 ft long and 60 ft wide. A rail head, two hydraulic truck docks plus a paint spraying booth are at the south end of this bay. Two overhead center-cab cranes, with 10- and 20-ton capacities, were required in this bay. Here the many units are assembled and moved toward the southern end of the bay where they are painted and readied for shipment.

Adjoining the erection shop is a 100 by 140-ft wood shop where wood fillings for some of Jones' products are made, and finished machines crated before shipment. A 3-ton underhung crane services a 40-ft-wide area adjacent to the erection building.

Offices for the general foreman and shop foreman are located centrally in each production bay. For space-saving reasons the large electrical transformers serving the plant were located above the office space between the heavy machinery and light fabricating bays.

The basic construction material of the plant is steel panels. Roofs consist of rigid glass-fiber board insulation, 1 in. thick; an air space, ⅞ in. deep; and Steelox panels, fabricated from aluminized steel.

On all permanent exterior walls, sculptured Steelox panels in Zincgrip steel were installed above 8 ft of masonry. On walls planned for future expansion the panels, spliced 8 ft from the ground, were used the full wall height. Insulated wall liners were placed on interior walls below the splices.

The manufacturing areas are heated by 138 Panelbloc infrared radiant heaters suspended 12 ft above the floor throughout the plant, about 20 ft apart. Each gas-fired unit has a capacity of 62,500 Btu per hour and is capable of heating an area covering 900 sq ft. Each unit also has its own thermostat.

A gas-fired 150 hp boiler provides the hot water for heating the 40,000 sq ft office portion of the plant.

For summer cooling, a 125-ton chilling unit, forces chilled water through overhead units located in the office area. These also ventilate and cool the employees' locker room and cafeteria areas.

Six exhaust fans, each with a 4000 cfm capacity, have been installed to remove fumes and smoke from the welding area of the fabricating bays. The remainder of the plant area is equipped with manually-operated ventilators along the roof peaks. Two 30,000 cfm fan units handle the makeup air. One is located in the receiving dock, one at the shipping dock. **End**

Fig. 5. Erection bay has high clearance, wide span for maximum flexibility, handling ease.

Schematic drawing with numbered ductwork indicates the individual systems which handle dust collecting from a particular area. Note that some of the systems tie into one another and eventually to the large separator, or filter system, which is final control point before dust is blown to vault for either shipment as a byproduct or fuel for the boilers.

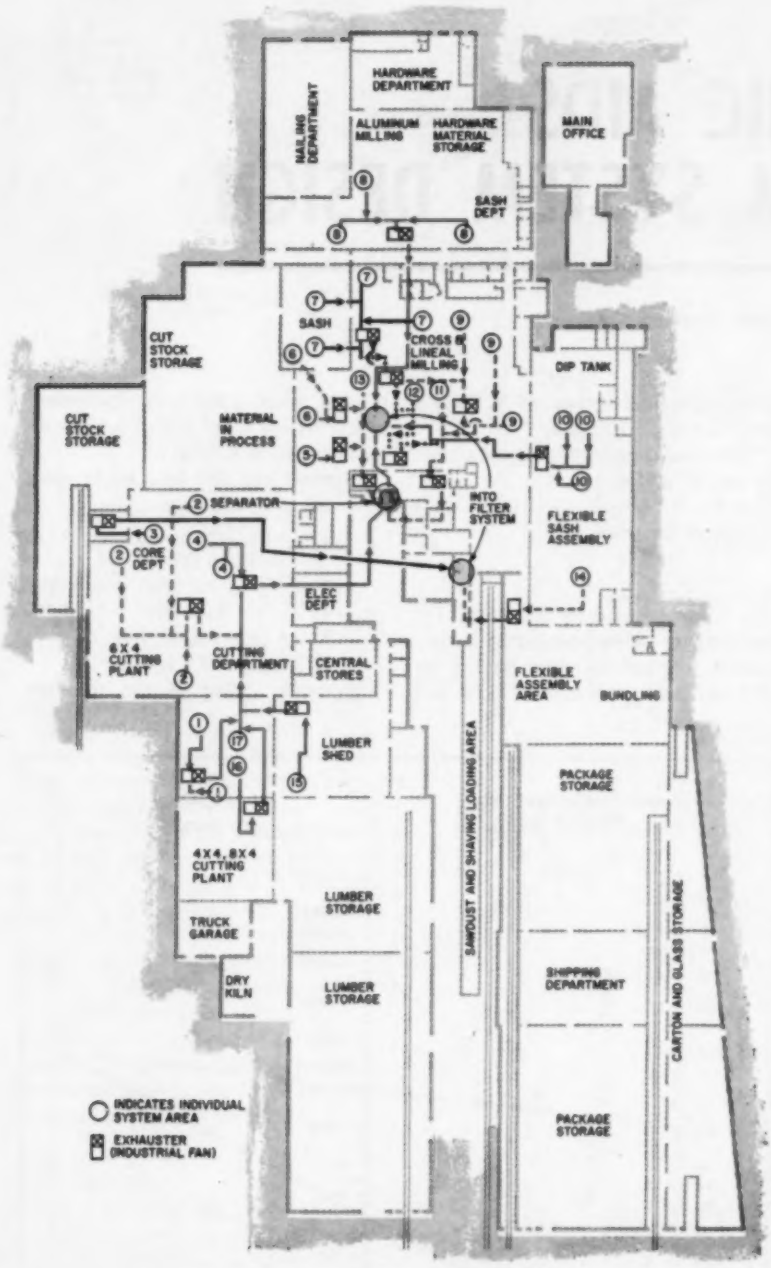
17-in-1 DUST COLLECTING SYSTEM TURNS WASTE INTO PROFIT

WITHIN the past year, the Andersen Corporation has equipped its Bayport, Minnesota, plant with equipment which collects dust from 17 specific areas. Dust control is extremely important here since they are operating one of the world's largest woodworking plants.

It is essential that this equipment remove hog chips, sawdust, shavings and sander dust in large quantities each day from different manufacturing operations. When the dust control equipment is in full operation, 125,000 lb of waste are removed daily. Every week a lineup of 18 freight cars is filled with sawdust and shavings. The waste that is salvaged and shipped in a year is worth approximately $150,000.

William B. Simonet, maintenance engineer of Andersen Corporation, worked closely with the engineering staff of the Day Company and management officials of the Windowall

This is just one of the 17 areas in the plant. In this section, the dust collecting hoods are situated over each of the sanding belts to capture sawdust before it reaches the air.



Corporation to "size" and design a practical dust collecting system.

As a result of this discussion, the company has installed 17 dust collection systems to serve the entire plant. These systems are capable of handling 350,000 cfm. The installation includes 21 dust filters, 20 exhaust fans and 15 dust separators.

The dust filters filter dust-laden air with 99.99+ per cent efficiency, removing even fine sander dust. In fact, the air is so clean after passing through this system that it can be returned to the plant. This method saves the plant thousands of dollars during winter because warm, heated air is recovered and recirculated throughout the plant.

Waste wood, not suitable to be glued into solidwood cores, is "hogged" to furnish fuel for the plant's three 250-hp boilers. These boilers provide steam for heating the plant and the drying kilns.

Good neighbor relations is another favorable aspect of the new dust control equipment. Formerly, fine sander dust would, at times, escape to the atmosphere and settle in the community, on the employees' cars and in the yards and homes around the plant. The efficiency of the dust filters has eliminated this.

Mr. Simonet noted several other additional benefits accruing from this dust collector system.

During the winter months the return of clean, warm air to the plant helps to lessen a partial vacuum within the buildings. Because of this, heating costs have been reduced. Formerly, this vacuum caused severe draft conditions from inrushing air when doors or entrances were opened.

In addition to lower boiler demand, the plant can now be effectively humidified. Before installation, it was impossible to control humidity because of air exhaust and no return.

Plant safety conditions are also improved due to eliminating the accumulation of highly flammable dust on the plant roof.

Plant housekeeping has also been made easier due to improved dust collection efficiency.

Mr. Simonet is pleased with the dust control system's adaptability to changes in plant layout as well as its simplicity of design. In the past they have moved a number of fans, removed machinery from one system and placed it on another, and added new machinery to one of the systems.

Because of the possibility of such changes, they feel that the entire system is flexible and that any changes in production can be well handled by their present equipment. **End**

NOMOGRAPHIC AIDS FOR VACUUM SYSTEM DESIGN

By **F. CAPLAN**, Kaiser Engineers, Kaiser Center, Oakland, California

THE accompanying nomographs will speed the design of vacuum systems in the "low" vacuum range, i.e., from atmospheric pressure down to approximately 0.01 mm of mercury. In this range the flow of air is said to be "viscous." More exactly, using the Reynolds number criterion, flow is viscous when the product of the average pressure, P, in mm Hg, and the inside pipe diameter (D) in inches, is greater than 0.2, i.e., $P\,D > 0.2$.

If the system is properly designed, flow will not be in the turbulent region. Design involves the proper size pump and piping, and the elimination of leaks.

Conductance, C, of a pipe, is the rate at which gas will flow through the pipe per unit pressure differential. In the viscous range, for air,

$$C = 520 \times \frac{D}{L} \times P \qquad (1)$$

C = conductance, c f m
D = pipe ID, inches
L = pipe length, feet
P = average pressure in the pipe, mm Hg

Since the conductance varies as the fourth power of the pipe diameter, a small increase in diameter will help the conductance enormously.

A graphical solution of equation (1) appears in Fig. 1. It gives the conductance of 100 ft of pipe having an 1 D of 2.49 in. at a pressure of 1.0 mm. Hg.

Align L=100 with D=2.49 and mark intersection on pivot line ∝; align this intersection with P=1.0 and read C = 200 cfm.

The conductance of pipes in parallel can be added, i.e.,

$$C = C_1 + C_2 + \ldots \qquad (2)$$

For pipes in series,

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \ldots \qquad (3)$$

Fig. 2 can be used for equation (3); for example, a vacuum pump is connected to pipes in series having individual conductances of 120 cfm and 60 cfm, what is the over-all conductance? Align C_1= 120 with C_2= 60 and read C = 40 cfm.

Figure 1 can also be used to compute the pressure drop.

$$dP = \frac{Q \times L}{520 \times D^4} \qquad (4)$$

dP = pressure drop, mm Hg
Q = air flow, cfm
L = pipe length, feet
D = pipe ID, inches

Example: What is the pressure

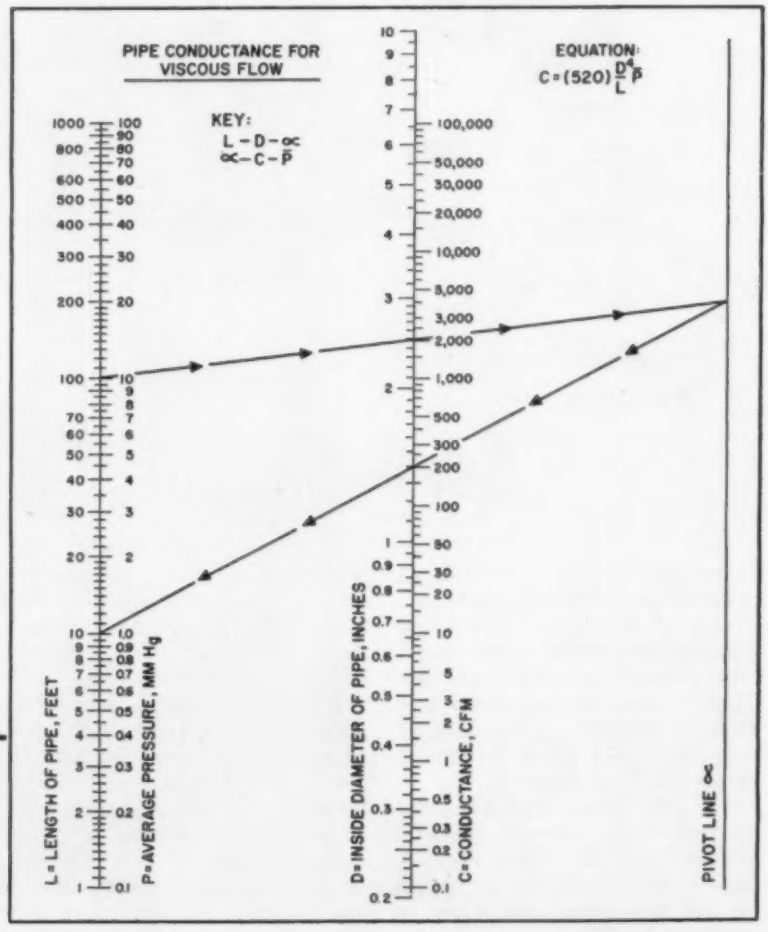

PIPE CONDUCTANCE FOR VISCOUS FLOW
EQUATION:
C=(520) D⁴/L P̄
KEY:
L - D - ∝
∝ - C - P̄
L = LENGTH OF PIPE, FEET
P = AVERAGE PRESSURE, MM Hg
D = INSIDE DIAMETER OF PIPE, INCHES
C = CONDUCTANCE, CFM
PIVOT LINE ∝

Fig. 1. Lines on this nomogram depict a typical solution of a problem which requires conductance in cfm.

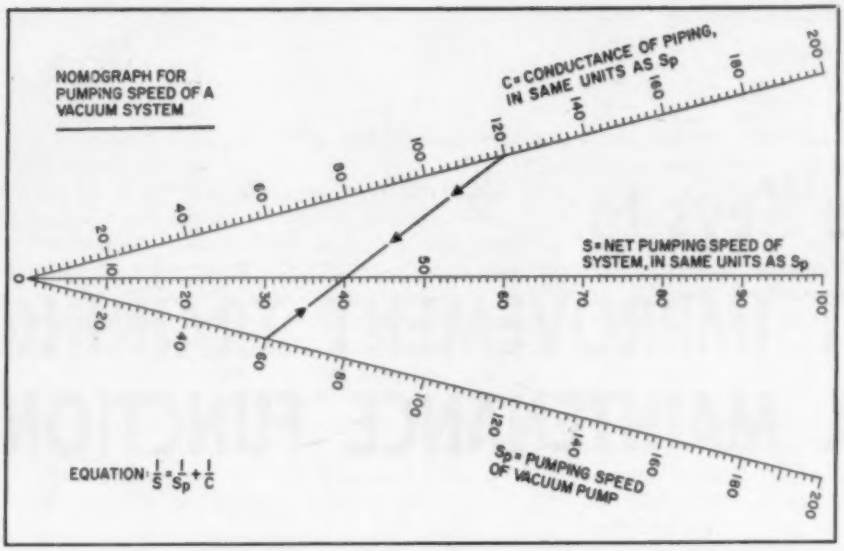

NOMOGRAPH FOR
PUMPING SPEED OF A
VACUUM SYSTEM
C = CONDUCTANCE OF PIPING,
IN SAME UNITS AS Sp
S = NET PUMPING SPEED OF
SYSTEM, IN SAME UNITS AS Sp
Sp = PUMPING SPEED
OF VACUUM PUMP
EQUATION: 1/S = 1/Sp + 1/C

Fig. 2. Given: Conductance of 120 cfm and pumping speed of 60. Find net pumping speed. Answer is 40 cfm.

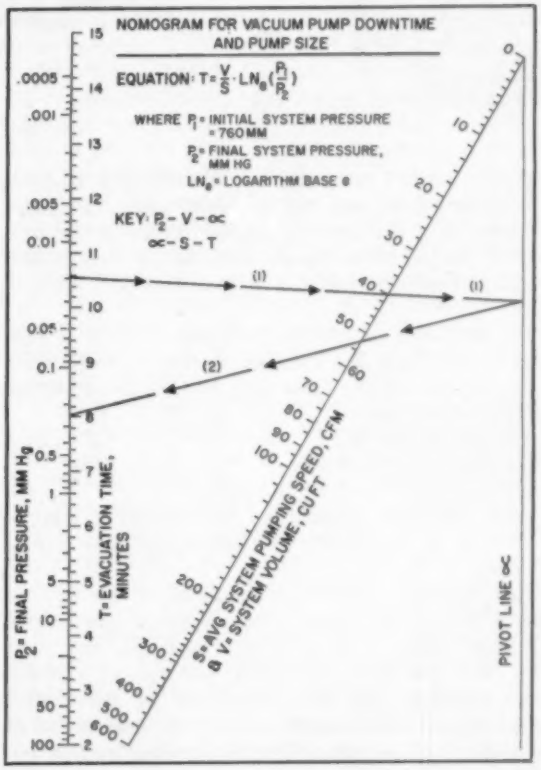

NOMOGRAM FOR VACUUM PUMP DOWNTIME
AND PUMP SIZE
EQUATION: T = V/S · LN_e(P1/P2)
WHERE P1 = INITIAL SYSTEM PRESSURE
= 760 MM
P2 = FINAL SYSTEM PRESSURE,
MM HG
LN_e = LOGARITHM BASE e
KEY: P2 - V - ∝
∝ - S - T
P2 = FINAL PRESSURE, MM Hg
T = EVACUATION TIME,
MINUTES
S = AVG SYSTEM PUMPING SPEED, CFM
V = SYSTEM VOLUME, CU FT
PIVOT LINE ∝

Fig. 3. To reduce pressure in 40 cu ft tank in 8 min. from 760 to 0.019 mm Hg abs, 53 cfm rate is needed.

drop for an air flow of 5 cfm in 100 ft of 1.05 in. ID pipe? Align L = 100 with D = 1.05 and mark ∝; align ∝ with C = 5 and read P = 0.8 mm Hg (pressure drop).

The capacity of the vacuum pump to remove gas is called its pumping speed (Sp). For mechanical vacuum pumps, Sp is the pump displacement multiplied by the volumetric efficiency and is approximately constant until the pressure becomes near that of the ultimate pump capability.

S, the pumping speed of a vacuum system, i.e., the vacuum pump plus connecting piping, has the following relationship to other factors:

$$\frac{1}{S} = \frac{1}{C} + \frac{1}{Sp} \qquad (5)$$

It follows from equation (5) that the effective pumping speed, S, is always less than either the conductance of the piping system, C, or the vacuum pump speed, Sp. For example, if Sp = 200 and C = 200, then

$$\frac{1}{S} = \frac{1}{200} + \frac{1}{200} \text{ and } \quad S = 100$$

If however, the connecting piping is adequately sized and the conductance is at least four times that of the pump speed, then the capacity of the pump is not excessively reduced; e.g., if

Sp = 200 and C = 800, then

$$\frac{1}{S} = \frac{1}{200} + \frac{1}{800} \text{ and } \quad S = 160$$

The time required to evacuate a vessel is given by this formula:

$$t = \frac{V}{S} \log_e \frac{Pl}{P_2} \qquad (6)$$

t = evacuation time, min
V = system volume, cu ft
S = average system pumping speed, cfm
P_1 = initial system pressure, mm Hg
P_2 = final " " , mm Hg

Graphical solution of equation (6) is in Fig. 3, based on this example: For a system having an average pumping speed of 53 cfm, how long will it take to reduce the pressure in a 40 cu ft tank from 760 to 0.019 mm Hg? Align P_2 = 0.019 mm with V = 40 and mark intersection on pivot line ∝; align this intersection with S = 53 and read t = 8.0 minutes on the scale at the left side of the nomograph. **End**

Three Keys to COST IMPROVEMENT TRAINING IN A MAINTENANCE FUNCTION

By **RICHARD K. CARLSON** and **CHARLES V. CRUMB**, Training Specialists, and **W. H. GODSHALL**, Manager, Plant Engineering
International Latex Corporation, Dover, Delaware

MOST OF US are aware of the difficulty involved in controlling and reducing both labor and material costs in a maintenance function. One of the best ways of getting better results and reduced costs in this area is through the use of a formal Cost Improvement Plan.

We were able to effectively implement such a program in our Plant Maintenance Section by using what we sometimes call the three keys to Cost Improvement Training, which are:

1. Setting the stage
2. Training the people
3. Giving recognition and awards

We feel that what we did, and how we did it, may be of interest to others who are looking for greater cost reduction in this area.

First, before we get into a discussion of the steps we took in each of the three areas, we would like to give you some background about our work situation. Our main office and plant location is the hub of a multi-plant operation. We have manufacturing, distribution and office buildings located within a 10 mile radius of the main plant, which houses the Engineering Department and Central Shops. This makes for a situation wherein jobs are performed at different locations without continuous direct supervision and, as in most maintenance functions, the work is mainly composed of non-repetitive jobs done on a shift basis.

Since we are located in an area of small farming communities, our pool for skilled maintenance workers is limited. There has recently been some influx of trained personnel, but many of our older service employees had little or no formal training for the jobs which they were holding. Maintenance supervisors recognizing this, had over the years, employed informal on-the-job training as far as practical with considerable success considering the limitations inherent with this type of training.

Setting the Stage

Our first step in setting up a maintenance personnel training program on cost improvement was to review the activity that had been initiated on cost improvement by the management and supervision of Plant Engineering. Activity such as this is frequently started with great enthusiasm; but without adequate, well designed and properly directed training incorporated in the plans, quite often degenerates into the limbo of mythical achievements. Fortunately, our engineering management recognized this danger and called upon the services of the Training Department to aid and supplement their efforts in developing an effective and continuously operating cost improvement plan.

The Planning and Control Section of Engineering in conjunction with Plant Engineering, which encompasses the maintenance function, had set up a cost improvement plan modeled on a reporting and control format established in the office and production areas of the company using Methods Improvement, Work Simplification and improved material utilization techniques.

This program was operating successfully through the employment of task force groups composed of engineers, technicians, draftsmen and shop superintendents and foremen of maintenance functions. The task force groups were led and assisted by the Planning and Control Engineers during weekly task force meetings. Efforts were made by superintendents and foremen in stimulating the development of cost improvement activ-

ity and ideas among the shop maintenance personnel with varied success.

A nucleus of these maintenance personnel had been generating and putting into effect improved ideas and methods on an informal basis over the years, but these were rarely documented and little credit had been received for this activity. However, the success of the program at this point led engineering management to believe the proper stimulation and training would not only bring greater benefits to the company, but would also lead to greater worker participation and satisfaction that would insure the perpetuation of the program. How to go about this with the limited time available by the Planning and Control Engineers and the shop superintendents and foremen was the question.

A formal training program in cost improvement seemed to offer the answer. However, there were some difficulties inherent in supplying this answer. We had a cost improvement training program in operation for other areas in the plant, and we first considered merely putting maintenance personnel in this program; however, a review of this course with Engineering indicated its limitations when applied to maintenance.

Both the training section and engineering management felt that to be effective, such a program had to be designed specifically for maintenance work because of its non-repetitive nature, the specific and varied job situations involved, and the need to instill a higher personal degree of interest and knowledge into the maintenance worker because of his inherent independence.

Previous to the establishment of a Training Department within the company, the Manager of Plant Engineering had been using whatever limited means he could find available to employ training for the benefit of both his supervisors and the shop workers. This included conducting a leadership course in bi-weekly meetings for his supervision over a period of approximately 18 months. Later, for a period of two years, the Personnel Department conducted a supervisory training course in which his supervision participated on a bi-weekly basis. Safety meetings were also held on a weekly and bi-weekly basis. These meetings were frequently used by foremen to present other job and skill training on an internal basis.

Shortly after the establishment of a Training Department in the company, the Manager of Plant Engineering and his supervision participated in several general courses that were made available for company personnel. These included Practice of Management, Essentials of Supervision, Effective Oral Presentation. At this point, we began talking about designing and developing training courses specifically for all maintenance personnel.

Also at this time, an Engineering Planning and Control Section was formed to formalize maintenance procedures, establish better cost control, develop and install improved planning and scheduling procedures, improve maintenance operations and procedures and improve work methods with a view to eventually establishing work measurement within the maintenance section.

Another step, that had been taken to upgrade personnel, was a reorganization of procedures for the selection and promotion of personnel and the development of improved job descriptions leading to a stronger but more liberal control of increase and promotion requirements. These new procedures pointed up more strongly than ever the need for self-development if individuals were going to make personal and financial progress, which was stimulated with improved control through these new procedures.

Discussion of these various factors lead to the development of an instructor education course for the shop's supervisors and leaders. This course was developed and conducted jointly by Engineering Planning and Control and the Training Department. Its purpose was to increase the effectiveness of the shop's supervisors and leaders in training their people in the latest maintenance techniques by sharing and imparting their knowledge and experience through improved communications and training techniques.

Once the Instructor Education course was underway, the response to it was overwhelming. The Engineering Department was gratified by the enthusiastic welcome this training received. The people in maintenance not only were receptive to it, they asked for more! We felt this was due to the fact that this course had been designed with maintenance procedures, methods, and situations in mind. Based upon this experience, we both felt considerably more certain that the success of a Methods Improvement course for maintenance personnel would be assured if the course could be developed around specific maintenance situations and with the specific needs of the maintenance personnel in mind.

However, to build such a course and make it appeal to both the highly skilled and better educated maintenance men and also the lesser skilled maintenance men with little formal education presented a number of problems. We, therefore, continued to proceed with caution as we felt that the first presentation of this course to maintenance personnel had to capture their enthusiasm and imagination to insure the acceptance of presentation of the same course to the remainder of the workers employed in the shop areas. The grapevine in any plant is a wondrous thing; and if you can have it on your side at the start of a program, it is a great help.

To enhance the possibility of this first success, we wanted to get all levels of maintenance management and supervision that had any contact with the operating maintenance man's situation and his thinking into the development of the program. Therefore, prior to starting the program at the operating level, we felt it would be necessary to first give all of the Engineering Department managers and supervisors a complete knowledge and background of the principles to be presented.

Consequently, an advanced Methods Improvement course was presented to all managers and supervisors. We solicited their comments relative to the development and conductance of this course, both previous to and during their participation in it. They responded with many ideas that were incorporated in the course and with much

enthusiasm. The material covered in the training included all the techniques that would be covered in the course to be given later to the operating personnel, plus the techniques of Work Distribution Charting.

Work Distribution Charting was included in the course for supervisors to better acquaint them with exactly what the work situation was in their sections and to give them a ready reference for their manpower utilization. Another advantage of having an up-to-date Work Distribution Chart was to have a tool to help in a systematic rearrangement of the work after the elimination, combination and the simplification of tasks, that hopefully would result from the operator training. The stress throughout the course was not dollar savings as much as it was human relations, and the part each would have to play to have their people help themselves.

The importance of being receptive to ideas was discussed as well as the most effective manner of receiving ideas from operating personnel. Stress was placed on treating all ideas with equal attention even though some would obviously be found to be impractical at the first consideration. Ways and means of encouraging participation were explored along with ways of establishing in the minds of supervision and in the minds of the workers that ideas for obvious improvements would in no way reflect on any previous performance.

This is one of the greatest obstacles to both stimulating and recording cost improvements. The fact that the highest levels of engineering management were present at the conferences and made a point of giving their complete support to this type of thinking made it possible for us to overcome this obstacle to a marked degree.

We had set the stage by showing engineering management and supervision that we were interested in them and their problems, we were receptive to their ideas and found them most receptive to ours. We showed them that we were interested in the training and development of their workers and more subtly that we were interested in their development and training. The cooperation and collaboration that took place was very effective in breaking down any possible lack of reception to ideas and reinforced in all supervision the natural desire to welcome and help develop their workers' ideas into savings for them and their department's benefit.

Training the Workers

Initially about one-third of the operating people volunteered to participate in the formal presentation of the Methods Improvement course. The personnel was broken down by classes with a maximum of 12 people in each group. The course, consisting of eight 2-hour sessions, was conducted on company time. During the first session, the philosophies of Methods Improvement were presented with a very strong emphasis on how the individual, once he had command of the basic techniques, could eliminate the waste from his job. The remainder of the first session and the next six were spent on Flow Process Charting, Flow Diagramming, Multicolumn Charting, Principles of Motion Economy, Right- and Left-hand Charting and Man-Machine Charting, with strong emphasis on Flow Process Charting and Man-Machine Charting.

The instructor presented the techniques using terms and examples that could be identified with the jobs of plant maintenance people. Charts and films were used to supplement the presentation and conferees were given problems to do in class to give them practice in developing improvements. Freedom of discussion was encouraged and the conferees, who were selected from all the maintenance areas and represented all levels of skills within each class, aided one another in solving their individual plant problems.

By having the conferees give assistance to one another in developing projects from raw ideas, it was found that many of the problems they encountered in their work were not really problems created by other groups, nor were they problems created by their supervision as they sometimes thought; but, quite often were situations of their own making.

By encouraging them to discuss these problems with one another, they were usually solved. Having them solved by their fellow workers developed their insight, their objectiveness and their concept as to their relationship to the over-all situation generally, and to their supervisor and the training program specifically.

The instructor did not press each conferee to submit a bonafide Cost Improvement Project before he graduated. However, he strongly encouraged this with the thought that the class could help him formulate his idea into a project while the course was still going on. It was found from past experience that, once a person turns in a valid project and finds out how simple it really is, he will be encouraged to turn in many other projects of particular interest to him.

The Manager of Plant Engineering indicated his personal interest in the training by checking frequently with the instructor who was conducting the course, by encouraging his people through informal chats and memos, and continually through personal letters to every person in the department who develops a successful project. On the final day of each class, he gave a graduation talk urging the men to put into practice the things that they learned.

A formal follow-up is still being conducted by the Training Department instructor who presented the courses. He visits the graduates at their work place, aids in writing up projects by coordinating their efforts with other departments concerned, and checks on problem areas. A continuing part of his follow-up is to make sure that each individual receives his awards and recognition as promptly as possible.

Recognition and Awards

We have a formal Awards Program whereby participants in the Cost Improvement Program receive merchandise of their choice based on their contribution to the program.

The outstanding contributors have their efforts publicized in the Cost Improvement Bulletin, local newspapers and on the company bulletin boards. The climax of this publicity is that the three outstanding contributors, within a given fiscal year, are given all-expense-paid vacations to a Caribbean resort of their choice.

Equally important as this type of recognition, is the personal recognition given to every participant by his own supervisor and the respect he gains from his own coworkers.

Results

Regardless of all the work and preparation by both the Training Department and Plant Engineering management and supervision, and the success of previous training programs cited, the results obtained from the first group of conferees who completed the course were not too gratifying. Many ideas and problems were brought out in class and many solutions were suggested; however, only three ideas were formally written up and put into effect.

This unexpected situation was discussed at some length by both Training and Engineering. It was felt that the situation should be handled openly. The results of the first group should be discussed with the second group without criticism, but rather with an open desire and effort to have them discuss the problem and possibly offer solutions. Certain concepts should be emphasized more strongly at the same time, along with the additional benefits, both tangible and intangible, that they would receive through their participation and the recognition of their ideas and their work.

Considerable discussion and evaluation of this situation led us to believe that this lack of immediate participation is quite often to be expected and we should calmly and objectively give them more time to consider the whole aspect of the program. They wanted and probably needed time to reassure themselves through discussion in and out of the course classroom that this participation concept was "for real" and not a gimmick with a catch to make them work harder for the possibly dubious benefit of personal recognition.

When the second group got underway, the instructor, therefore, told them of the accomplishments of the first class. He emphasized the fact that all the ideas in the world are worthless unless someone takes the initiative and puts them into practice. Problems and wasteful practices could remain as long as people merely talked about them, but did nothing. It was emphasized that the company had set the program up with the idea of training and encouraging people to take the initiative. The basic philosophy was to give people a voice in improving their own jobs. This, in turn, would give them a more personal interest in their work which would result in more efficient workers and a better company spirit. At the same time, management personnel of Plant Engineering redoubled their efforts to stimulate the men to develop their ideas into projects, talking to the men on the job, pointing out ideas that could be developed, inviting open discussion on the course in their bi-weekly safety meetings and outlining the benefits.

After the presentation to this group, a transformation took place. The men apparently decided to give the program a real test. They began to put in projects, and when they found out that their own supervisors were not only fully receptive to their ideas, but were also willing to help them work them out, the word spread fast and participation soared. Even the men who had resisted change now wanted an opportunity to participate in the program.

By the end of the first year of participation by the Engineering Department, the dollar savings of the group had equalled that of most of the other departments who had been in the program previously. The startling fact was that although only about half of the personnel had been through the formal class, their achievements had carried over to other people who also took an active part in it.

We would like to point out that our success was not attributed to any new techniques or gimmicks. It was a sincere and down-to-earth approach that gained the respect of the conferees. No one was forced to turn in projects. No individual goals were set. The conferees were given the techniques and philosophies and were told that the rest was up to them. If they wanted job improvements with their ideas incorporated in them they now had the "know-how" to make them.

One of our major efforts, aside from the formal training, consisted of the all important follow-up. We set up a definite schedule so that we would tour all the areas where maintenance people worked. We encouraged people to stop and tell us their ideas and get advice if necessary, but we refrained from asking for projects. In this way we were able to aid people without bothering them.

The tangible benefit of being able to reduce costs more effectively meant a great deal to our maintenance function and the company. However, we feel the greatest benefit was of the intangible kind—that of the change in attitude. The men have developed more of a personal interest in their jobs, and more pride in their company. This has resulted in a real feeling of teamwork and willingness to cooperate with the people in their section and in other departments and divisions. The result of this was a highly satisfied and enthusiastic group of engineering supervisors and a group of more efficient workers.

Add all of these things to the dollars and cents we have saved and we conclude that we have a fine Cost Improvement Program in our maintenance function. Perhaps what we did, and how we did it, will work for you. We recommend it. **End**

The author standing beside a typical set of crane components. Locally-bought structural steel and a drive shaft complete the job.

Should You Build Your Own OVERHEAD CRANE

"It all depends," might seem to be a weasel-worded answer, but it's the right one. See how your plant stacks up

By **JOHN C. EBY**, Design Engineer
Hoist & Crane Division
Robbins & Myers, Inc.
Springfield, Ohio

IF YOUR PLANT modernization plan calls for the addition of an overhead traveling crane, all the attendant benefits can be yours at greatly reduced cost if you assemble it yourself from purchased components. That is, if conditions are right.

Many plants have experienced savings up to 30 per cent or more by following this plan. A thoughtful evaluation of the conditions presented here should help you decide 1. if such a plan is practical and 2. what your expected savings might be.

We will not tell you, in this article, *how* to assemble a crane. This information is provided by most crane component manufacturers when you are ready to buy. First of all, you must decide whether buying or building will be the best course, and our task is to give you all the pros and cons so you can make the most advantageous choice.

There are, of course, sound reasons why some plants should buy only complete cranes. Plants lacking the facilities simply cannot take advantage of the "component method" cost savings.

When you buy a complete crane from a crane builder, you receive certain assurances and benefits not present when you assemble the unit yourself. They are:

A. Single nameplate responsibility for the crane's performance,
B. Full benefit of the crane builder's experience, and
C. Uninterrupted use of your plant's equipment and manpower.

On the other hand, with the "component method" you can take advantage of:

1. The considerable saving in purchase price by . . . eliminating much of the crane builder's labor and materials cost, and a sharp reduction in shipping cost.
2. The fabricating skills existing at your plant.
3. The possibility of having your crane in operation at an earlier date.

Which of these groups of benefits is most important to you?

If "A-B-C" outweighs "1-2-3" you should probably buy the complete unit, but if "1-2-3" predominates or the two are equal, then the component system bears further study.

For the first phase of this study, analyze the skills and experience of your plant—whether you have the personnel, the time, the space, and the equipment to handle the required assembly and electrical work.

You will note that design skills are not included in the above list. As we stated earlier, most crane component suppliers will see that you are provided with accurate assembly data and a list of parts for you to purchase locally. Your job is to see that the

components are assembled according to instructions.

If the crane is being fabricated in the same room where it will be installed, you need allow only a modest working area around the perimeter. If assembly takes place elsewhere, you will be obliged to allow ample "jockeying" space for moving it to the eventual destination.

The equipment requirements are usually quite simple. All mechanical fabricating can be accomplished with the typical assortment of maintenance tools found in most manufacturing plants.

Electrical work in a build-it-yourself effort involves the installation of distribution systems for the bridge drive and hoist trolley, as well as some simple wiring in the hoist. Wiring diagrams are provided with the complete set of components for the guidance of any qualified electrician.

Local codes may, of course, dictate wiring or electrification other than recommended as standard by the component manufacturer. Your own maintenance electrician will probably be familiar with these codes and will act accordingly.

The second phase concerns the location of your plant and the cost of structural steel in your area. The shipping charges on bulky fabricated steel are generally quite high, but so is the cost of raw materials in some sections of the country. You should check the figures both ways.

Understand that when you buy a complete crane, you not only reimburse the supplier for the freight cost of raw materials shipped to his plant, but you also pay for the shipment of the finished product to you. Although these charges could be insignificant when you are located close to your crane supplier and in a section where steel is expensive, if the opposite conditions are in effect (which is more often the case) you have another strong economic argument for building the crane yourself.

Phase three involves your assessment of the "risk factor". Will you be satisfied with a manufacturer's warranty on the components alone? Are you willing to face some problems that a crane builder might take in stride but which would be totally new to you? If your answers to all these questions are affirmative, the conditions are right, and the promise of savings remains undiminished, you are now ready to take some positive action.

When choosing your crane builder or component supplier, it is wise to seek out those firms with particular experience in building the type and size of crane you have in mind. It is also wise to check with firms who can supply both components and complete units so that:

1. You are more likely to receive an impartial recommendation.
2. You can hold "shopping time" to a minimum.
3. Component quality is likely to be identical to that of a complete crane.
4. Engineering aid is always available for your application.
5. The more components you buy from one source, the more exact their mechanical and operational match.

Follow the same procedure as shopping for a ready-built crane. Describe the service you're building for —capacity, duty cycle, bridge speeds, type of hoist, controls, lift distances, hoist speeds, and power available. Then prepare clearance drawings showing all obstructions and overhead and side clearances of the area where the crane will be erected. When this is done, all the data should be submitted to the qualified supplier or suppliers of your choice.

From this information, the crane builder will offer his quotation on the components required (exclusive of the parts to be obtained locally) and, if you wish, a price on the complete crane for your comparison.

Upon receipt of your order, the crane manufacturer will furnish you with certified drawings and complete instructions for your application. He will specify the type and size of bridge beam, the type and size of cross-shafting, and other items you will need.

It may be necessary to insert a warning against going too far with this do-it-yourself thinking. It would be a major mistake, for example, to try to build the crane from "scratch".

While it is possible to buy such parts as motors, wheels, gears, and brakes separately, you will probably have to contact many different sources to obtain all the parts you need. This not only makes "shopping time" an undue expense, it can play havoc with reliability and may eventually cost you more than the individual components in sub-assembly form.

The crane component manufacturer is geared to turn out soundly-designed parts in quantity, and it is extremely doubtful that you can match his product quality at anything near his selling price.

Since a typical factory-built crane —one comparable to most build-it-yourself units now available—may cost as much as $10,000, a saving in the neighborhood of 30 per cent could be quite substantial. This should be an inducement for any plant able to meet the stated conditions.

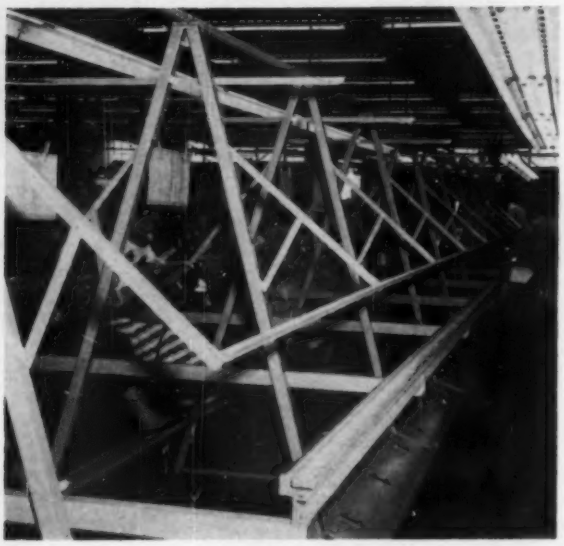
Briefly, these conditions are: your critical assessment of the economic values, your willingness to perform assembly and erection operations without direct assistance, and your overall capability to perform the required tasks. **End**

This checklist should help you decide. Count each answer in Column A as 1, B as 2 and C as 3. If score tops 21, build it; if less, buy it complete.

DECISIONS	A	B	C
How highly do you value cost saving?	Unimportant ( )	Secondary ( )	Primary ( )
How soon do you need the crane?	In 6 months ( )	3 months ( )	Yesterday ( )
Can you handle mechanical fabrications?	No ( )	If necessary ( )	Yes ( )
Can you handle electrical projects?	No ( )	If necessary ( )	Yes ( )
Do you have some available work space?	No ( )	If necessary ( )	Yes ( )
Can you spare the manpower temporarily?	No ( )	If necessary ( )	Yes ( )
How important is single responsible responsibility?	Primary ( )	Secondary ( )	Unimportant ( )
Are you located close to a crane supplier?	Yes ( )	Not too far ( )	No ( )
Is the local cost of steel . . .	High? ( )	Moderate? ( )	Low? ( )
TOTAL CHECKS IN EACH COLUMN			

Left: One side of structure contains adjustable slide tracks along which product moves, station to station.

Below: Opposite side of structure is tooled and prepared for next product. Thus, changeover time is eliminated.



TWO-FACED ASSEMBLY LINE—

How it solved a product changeover problem

IN TOOLING THE final assembly line at Altec Lansing Corporation, Anaheim, California, one of the nation's leading producers of quality high fidelity electronic and speaker components, a major problem had to be solved. The electronic products (tuners, amplifiers, preamplifiers, etc.) are produced in relatively small lots of 100 to 200 units each. This requires frequent assembly line changeovers from one product to another. The problem was to provide assembly line tooling that would eliminate downtime during a changeover while the line was being tooled for the next product.

The problem was solved by erecting the simple A-frame structure shown in the photographs. The two opposite faces of this structure actually provide room for two assembly lines in operation at one time, but this was not the idea that prompted the design. Instead, it was considered that while a product was being assembled on one side, the opposite side could be tooled and supplied for assembling the next. The simple sliding tracks along which the chassis moves from one station to the next are adjustable in width for handling the many different sizes of electronic assemblies.

In operation, when the first assembly operator on the line finishes his last operation on the last product in a production run, he merely moves to the opposite side of the line and goes to work on the next production run. This changeover progresses as each operator along the line finishes his last operation on the last product in a run. By the time the last product reaches the last assembler, the changeover is complete and in operation except for the last assembly station.

Thus the assembly line as a whole is never shut down for changeover, and lost employee time during the changeover is eliminated. If the starting assembly line requires more or fewer employees than the line finishing a production run, compensation can be made as soon as the changeover occurs. **End**

Q & A ON FILTERS

The First Line Of Equipment Defense

Based on an interview with
LEWIS L. DOLLINGER, JR., President,
Dollinger Corporation, Rochester, N. Y.

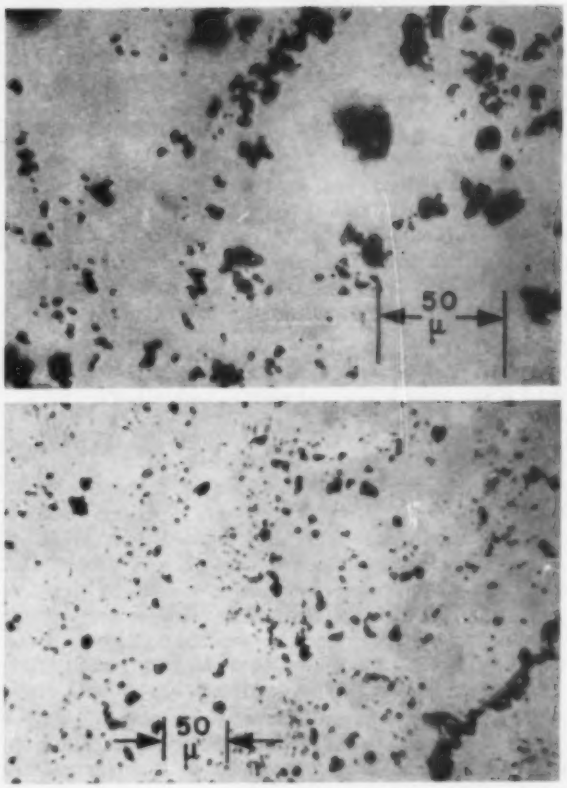


Fig. 1. Microphotograph of particles of dirt in compressor intake air. Fig. 2 (lower photo): Here are typical dust particles found in ambient atmosphere.

THE ADVANTAGES of proper filtration are so numerous it is unfortunate that there is not more widespread knowledge about the science of filtration and that this science is not always properly employed.

Every automobile on the road today has at least one and usually two filters—one to keep the road dust from the carburetor and a second one to prolong the life of the engine oil and keep abrasive dusts from the bearings and other working parts. Yet the same individuals who will religiously change the oil filters on their cars and insist on regular cleaning of the air filter will attempt to run a million dollar plant without proper filters at proper points.

Where are filters most commonly used in industry?

Filters are used, although not as effectively as they should be, on air intake lines to compressors, blowers, and air conditioning, heating and ventilating systems. They are used to protect food stuffs and delicate chemicals from contamination. They are used to keep the least trace of dust from delicate testing operations. They are used in utility gas lines to prevent entrained dust from clogging pilots and burners. Diesel fuels as well as combustion air and lubricating oils are filtered to prevent nozzle clogging and engine wear.

Products at many liquid and gaseous stages of manufacture are themselves filtered to remove foreign matter and contaminant. Machine oils and cutting fluids are reclaimed through filtration. Pollens and even bacteria are removed from the air of hospitals and laboratories.

Special types of filters have been developed for just about every application in industry. But, even now, too often filters are included in flow charts only after trouble has developed.

Can you give us a specific example of an installation where filters should have been used in original design but were not?

In one instance, a manufacturer of precision gages, many of which were used in missile work and rocketry, built a clean room for precision testing of these instruments. It was air conditioned, because temperatures had to be kept within extremely close tolerances. The owner assumed that the filtering elements of the air conditioning units would be able to keep the air clean.

However, the troubles that soon developed convinced him that the equipment as installed could not do the job properly. So, a filtration expert was called in. Filtration equipment was installed ahead of the air conditioning units and this removed a very high percentage of particles down to one-tenth of a micron.

How can you explain the passage of large particles of dirt when the filter is supposed to stop particles that are one-tenth that size?

This is easily explained by the fact that, when these particles are in the air stream they will align themselves along their major axis of, let us say, 100 microns. However, the greatest dimension presenting itself to a cross section of the stream might be in the order of only one

to five microns. When they enter the filter in this manner they are much more difficult to remove.

What factors should engineers look for in determining the need for filtration and how should they specify the type of filters needed?

First, the engineer must have knowledge of the nature of the dirt or contaminant to be removed. Second, he must know what dust level can be permitted in the effluent gas or liquid. Other factors that could affect the solution to a filtration problem are: flow, viscosity of the fluid and pressure drop permitted. Proper length of interval between servicing of the equipment is another factor but, unfortunately, this is one factor that cannot easily be calculated.

Why is the service interval hard to calculate?

Generally, there is very little information provided to the filter manufacturer by the customer on the nature of the contaminants the customer wishes to remove from the fluid stream. Therefore, a high "experience factor" must be employed by the filter manufacturer to allow a reasonable operating period between servicing of the filters. If all prospective purchasers would give detailed information on their problems, filter manufacturers could more accurately determine the possible dirt load. Illustrated is a typical fluid filter data sheet that, when filled in completely, gives the information required by a filter manufacturer.

It is always well to realize that the size of the collecting cartridge determines the frequency of servicing. With nearly all liquid and air intake filters one can double the capacity of the filter simply by increasing the original filter cost by 10 per cent. This is especially pronounced in liquid filtration.

Once you have determined the proper size line, correct pressure and rate of flow you will, simply by lengthening the filter shell and adding an additional cartridge, increase your costs by only ten per cent. Nevertheless, you will be able to operate the filter without service for periods two to three times longer than would have been possible with the smaller filter.

Is there a variation in the types of dirt removed from air or liquids by filters?

The filter manufacturer's problems are complicated by the fact that some customers entertain misconceptions regarding the nature of dirt that is to be removed. Ordinary "dirt" comes in varieties of sizes, shapes and chemical compositions. Many people assume that dirt particles are spherical, like nice, round agates. Actually, under close examination, see photos, they nearly always have sharp, jagged edges. Furthermore, many particles which seem to be single particles are, when examined under an electron microscope, revealed as agglomerates. Often too, in checking an installation for the degree of contamination present it is found that a dirt sample will change in character between the time it is collected and the time it is examined in a filter manufacturer's laboratory.

What about specifications demanding a removal of everything down to one micron?

While specifications frequently are written with demands that all particles down to one, five or ten microns must be removed, it is generally admitted by filter manufacturers that there is no such thing as 100 per cent filtration. There will always be some larger particles passing through the filter. (See answer to the third question.)

Are the sizes of test dusts reliable and accurate?

There are almost no available tests dusts wherein 100 per cent of the particles are in the range below 10 microns. Usually, dusts are classified by particle size bands, i.e.: 0 to 5, 5 to 10, 10 to 20, 20 to 40, 40 to 80, and over 80. Attempts have been made to prepare dusts of a given size, the latest one being a dust which contained 10 per cent dust in the 2 micron range. It is extremely difficult, how-

FLUID FILTER DATA

COMPANY_____ ADDRESS_____

FLUID TO BE FILTERED: _____ CAPACITY: _____

VISCOSITY (answer 1): (a) _____centipoises; (b) _____centistokes; (c) _____saybolt seconds;

(d)_____. Temp. at which viscosity is given:
(Give other unit or compare with a familiar fluid)

_____°F. (or) _____°C.

DENSITY (answer 1): (a) _____lbs./gal.; (b) Sp. G._____; (c) _____
(other unit)

MAXIMUM OPERATING TEMP.____°F. (or) ____°C. AVERAGE OPERATING TEMP.____°F (or) ____°C.

Solids to be removed: (a) Composition:_____

(b) Physical nature: (check 1) ☐ Fibrous (thread-like) ☐ Granular (hard, non-sticky) ☐ Gelatinous (soft, sticky) ☐ _____ (describe)

(c) Particle sizes to be removed: _____microns (or) _____thousandths of inch.

_____% by volume _____cu. in. per day.

_____cu. in. per 1,000 gal. _____
(other unit)

EFFICIENCY REQUIRED: _____% Material to be discarded (if any) Liquid Solids

DUTY (check or fill in 1): (a) Continuous; (b) _____hrs. per day; (c) No. of _____gal. batches per day_____.

IS FLUID CORROSIVE? _____If so, what materials are suggested: (a) For filtering medium? _____

(b) for tank construction?_____(c) for tank interior coating? _____

WHAT MATERIAL WILL BE USED FOR PIPING: (a) Ahead of filter? _____

(b) After filter? _____

SPACE LIMITATIONS (answer both): (a) Horizontal ____ X ____; vertical _____

PIPE CONNECTIONS: (a) Nominal size, ____in.; (b) Type (check which), ☐ Threaded ☐ Flanged or ☐ Welding.

MAXIMUM LINE PRESSURE: ____lbs./sq. in. MAXIMUM ALLOWABLE PRESSURE DROP THROUGH FILTER: ____lbs./sq. in.

Representative liquid sample submitted: Yes ____ No ____

Representative Dust sample submitted: Yes ____ No ____

ABOVE INFORMATION FROM:

_____

By_____

This fluid filter data sheet is used by author's company to determine sizes of filters and degree of filtration needed for specific customer application.

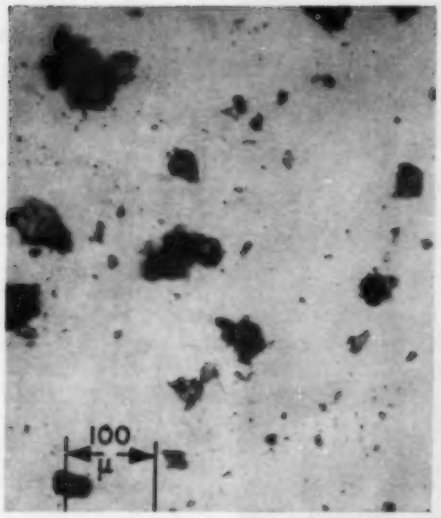


Fig. 3. One of many varieties of "dirt" are these particles discovered in natural gas.

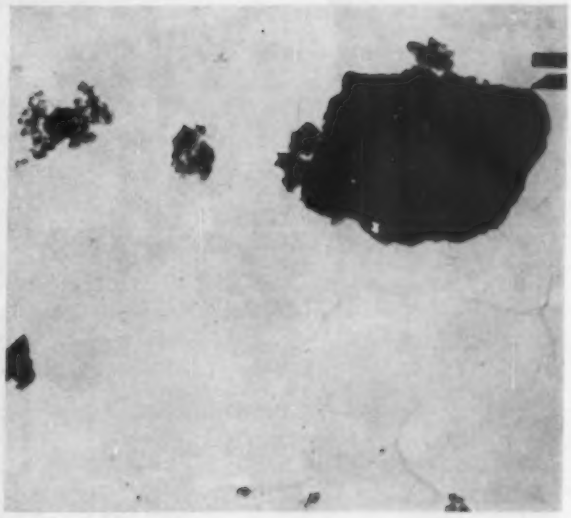


Fig. 4. Many dirt particles seem to be single units. However, the electron microscope reveals them as agglomerates.

ever, to test with these particles with present methods of analysis.

Will a perfect filter ever be developed?

When filters were first developed to remove dirt from atmospheric air supplied to tractors, engine tolerances were quite broad. Since that time, due to increase in speed, horsepower and changes in other factors, such tolerances have become much finer and the search is on for what is termed the perfect filter. However, it is felt at this time that we will not get a perfect filter although the necessity for approaching such perfection is far greater today than it was 10 years ago.

Are there any figures on the actual cost of improper filtration?

Many filter users are not aware of the high cost of improper filtration. A filter that is not designed for the job it has been assigned to do may require almost constant maintenance. Usually, because this work is done by the maintenance department as a part of its normal operations, no separate cost records are kept. Downtime is not even recorded as a cost factor until it becomes so troublesome that it cannot be ignored.

How would you summarize your recommendations?

It is recommended not only that a careful study be made of each operation but that complete dust studies also be made. Samples should be taken from various locations or at different spots in a processing system and analyzed in research labs to determine particle sizes and agglomerates. The system itself should be analyzed carefully to see what size particles or types of agglomerates might cause difficulties. Below ten microns it is axiomatic that the cost of fine filtration will increase very rapidly as the particle size to be removed is decreased.

A review of many such analyses will help lead to more accurate specifications. The resulting realistic appraisal of filtration needs will almost certainly be reflected not only in economies in plant and equipment operation and in improved products, but also in far better service from the filter manufacturer. **End**

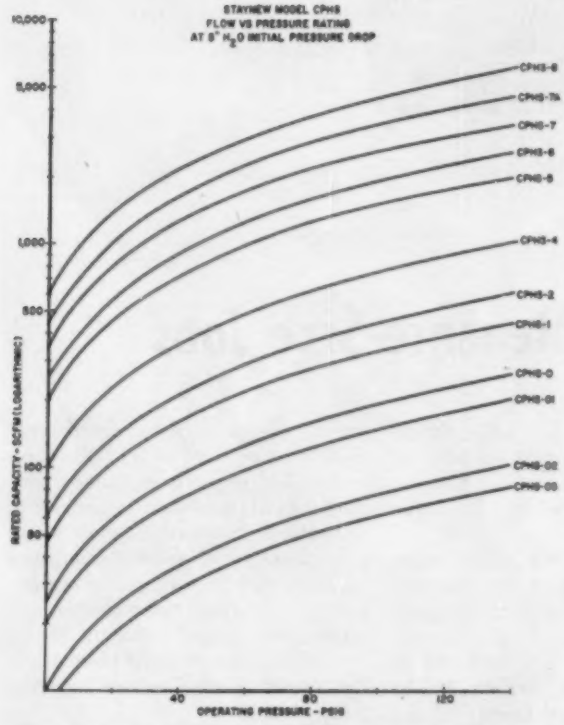
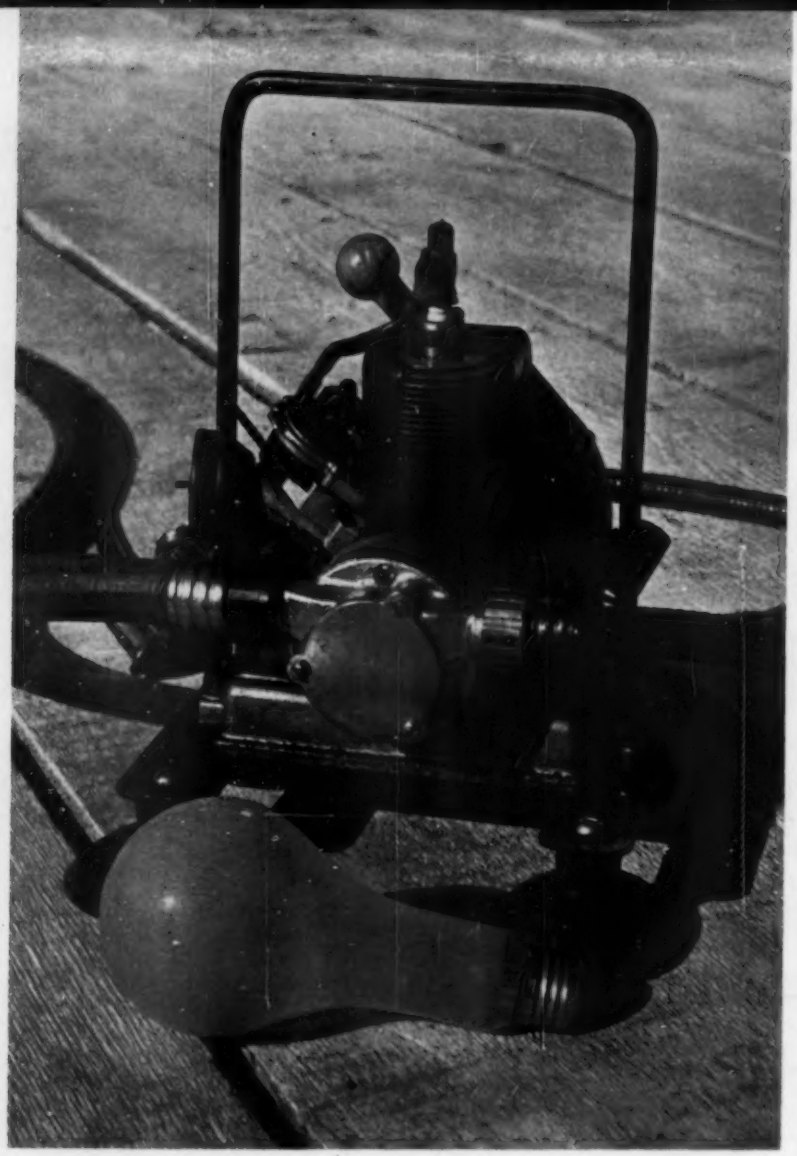


Fig. 5. This is typical of charts used by author's company to size filters for standard applications. Special applications for filters require engineering.



Here's one of the Ultra Compact engines rigged to small pump. Note unit's size compared to bulb in foreground.

MIDGET ENGINES

For Maintenance-Size Jobs

"IT LOOKS LIKE a toy," shrugs an incredulous plant engineer in California, "but in fact it's a tool . . . about as versatile as any in maintenance's kit."

He's talking—as are many maintenance men—about the "mighty midget": a new generation of gasoline-fueled engines so small (only 5¼ in. high) you can hold one in your hand, so light (weighs 3¼ lb bare, 4¾ lb with fuel tank) you can carry one in your tool kit, yet hefty enough (develops ¾-hp, continuous) to drive a phalanx of portable plant tools. That, or power an equally pint-sized electric generator whose a-c or d-c output (110-volts, 60-cycle a-c or 6 to 12-volts d-c) will run emergency trouble lights (up to 200+ watts), charge batteries, monitor remote pumps and gages (without having to hook them into plant power) and do 100-and-1 other routine but vital plant chores.

The midgets not only have the

capacity of ½-hp electric motors—but are pounds lighter. In fact, for their power output, they're the lightest practical industrial engine ever built. Important as their weight is their self-sufficiency: as wholly self-contained power units, they're designed to operate anywhere (in the most power-inaccessible of plant areas and even in the accessible areas where wiring for quick jobs or non-repetitive ones simply isn't economical).

One basic midget engine fits nicely into a cubic space but 5¼ in. long, 5¾ in. high and 6 in. wide (this is exclusive of the engine's single spark plug and shaft extension). With fuel tank, the engine weighs 4¾ to 5¼ lb.

"The midgets," says one admiring plant engineer, "seem cut out for hundreds of plant assignments."

Some of the more obvious: as pump drives, emergency power stand-bys, motive power for a long line of portable carry-'em-with-you tools.

Although rated ¾ hp, their governors quick-adjust for somewhat higher, intermittent overloads. The little engines run for hours delivering ½ hp ("standard" fuel tanks permit about 45-minutes' continuous run at ½ hp, with hourly fuel consumption pegged at about one pint).

Forerunner of this, a whole new generation of miniaturized prime movers, is the spanking new Ultra Compact midget engine (designed by Ohlsson & Rice, Inc., 3340 Emery, Los Angeles, long-time model airplane engine makers).

Though introduced less than 4 months ago, the "mighty midget" is already being commercially harnessed for plant chores:

● **Portable Saws.** The engine powers a new cordless hand-held, portable saw, the engine-saw combination requiring no electrical connection. Simply pull the starting cord (which turns the flywheel and its three cast-in-place permanent magnets), and the little engine revs up—driving a standard 8-in. circular blade which can make 90-degree cuts to a depth of 2⅝ in., 45-degree cuts to 7⅞ in. Called the C/Saw (by its maker, Comet Mfg. Division of the Siegler Corp., 2033 Santa Fe Ave., Los Angeles), the unit weighs only 11 lb (less than saws electrically powered), promises to make many a maintenance crew really portable.

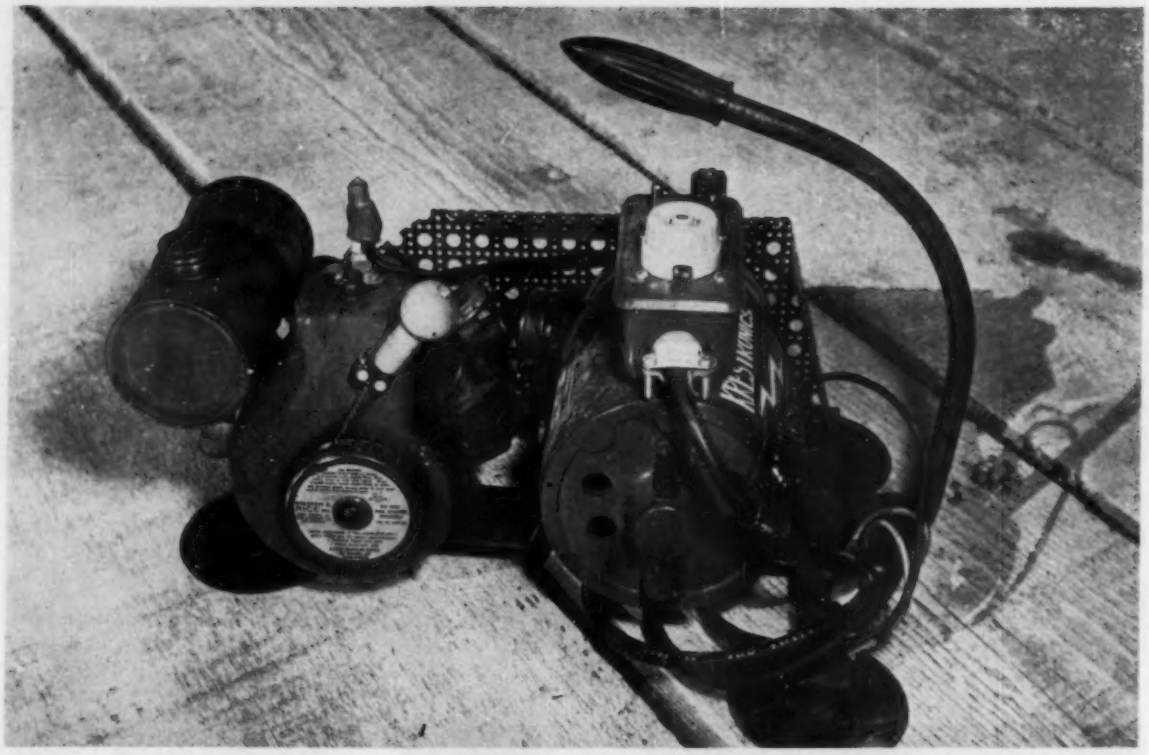
● **Portable Air Compressor.** The compact engine has been wedded to a small, portable air compressor by Westec-Sweetland Co., Los Angeles. The midget engine drives the compressor to deliver 1½ cfm of oil-free air at 50 psi.

● **Back-Packed Sprayer.** Another potentially useful housekeeping (and gardening) plant tool is the power-packed "duster" (sprays various chemicals, including insecticides), which straps to operator's back. Midget engine, developing 6300 rpm and directly driving a blower, permits operator to back-pack the engine sprayer, and 30 to 40 lb of chemicals (dry), apply them quickly from a single nozzle or from dual spray nozzles (dual nozzles are optional for this unit, made by Powerpack Equipment Co., Vista, Calif.).

● **Portable Prime Mover.** In-plant occasions arise when a heavily-laden materials handler or other wheeled carrier must be moved . . . and summoning a tractor or similar power unit wastes time. Thus, the hand-carried "tractor" which uses one of the midget engines hooked to a drive wheel which, by a pressure control, contacts a vehicle's wheel . . . and gets it rolling. One of the first applications of this "hand tow" has been as a kind of hand-held prime mover for handling (and moving) small aircraft.

● **Portable Generator.** As far-reaching, plant-wise, as any midget engine adaptation is the a-c/d-c generator which manages to produce

Engine used to recharge battery when coupled with portable alternator. It delivers 6 or 12 volts. Battery can be quick-charged in 10 to 20 minutes.



Perhaps most unusual of the midget-engine-powered plant tools is this 22-lb alternator—shown in use on opposite page. It delivers 110 volts, 60 cycle, 200-300 watts a-c and 6 or 12 volts d-c for charging batteries. Alternator substitutes 8 diodes for usual commutator. Unit can power emergency lights, low-wattage electronic gear of all kinds, has numerous a-c - d-c applications. To switch from a-c to d-c just flip toggle located atop unit's control box.

MIDGET ENGINES

110 volts a-c, 60 cycle, or 6 to 12 volts d-c (typical application: battery charging). The combine—midget engine, generator and a common chassis—weighs but 22 lb, and this includes a gas tank which holds about 9 to 10 ounces of outboard motor type oil-gas mix, good for upwards of 40 minutes' operation. The generator—now in the prototype stage and designed by Krestronics, Inc., El Segundo, Calif.—should find hundreds of plant uses.

● **Automated Pruner.** Yet another plant-applicable midget-engined tool is the motorized pruner, the self-contained unit weighing but 12 lb (10½ lb of the weight is backpacked or belted to the operator's waist), its fuel tank holding about 2 hours' supply.

Obviously, the midget is an engine with a plant future . . . and with reason.

The two-cycle, single-cylindered Ultra Compact, as typical, revs up to 6300 rpm (its design speed), but can be geared down to a high-torque 900 rpm, or such intermediate outputs as either 1700 or 3300 rpm. With direct-drive clutch, governed shaft speed is 6300 rpm. A 6.921 to 1 gear ratio reduces shaft speed to 900 rpm, a 3.666 to 1 ratio to 1700 rpm and 1.896:1, to 3300 rpm.

The designer claims that the midget will operate in any position, either upside down or vertically and runs 8 hours on a gallon of fuel. Recommended mix: ¾ pint SAE 30 oil per gallon of regular grade gasoline.

The engine has a 1.032-in. stroke, a 1.250-in. bore, a 1.26-cu. in. displacement . . . and a 4.86 to 1 compression ratio. Depending on gearing and accessories, the midgets are priced $41 to about $49.95. Offered as accessories are five different remote mufflers (which succeed in quieting what otherwise is a raucous little power plant). As a key to the engine's low cost: a 3-cup remote muffler costs but $1.50, while a 7-cup (and super-hush) muffler catalogs for a mere $2.30.

Tiny though this new generation of industrial engines may be, they're spitting images of their larger brothers—common to plant applications everywhere.

The Ultra Compact, as typical, breaks down into five sub-assemblies: blower housing, flywheel, cylinder, crankcase and induction case assembly.

The magneto ignition, for one, is miniaturized—but not really complex. It consists of a spark coil, condenser, flywheel magnets, contact points, push rod and spark plug. When the flywheel rotates, the cast-in-place magnets set up an electrical flux through the steel laminations that are encased by the coil. The primary windings in the coil (in conjunction with the points and condenser) draw electricity from this magnetic flux. This rather low alternating current is stepped up to high voltage through the secondary windings of the coil. When voltage has peaked on each rotation, the spark plug fires—igniting fuel and air compressed in the combustion chamber.

A "standard" engine? The midgets

(Continued on page 201)

ELECTRONIC CONTROLS— Modern Safeguards for Automatic Boilers

By **PAUL E. BUDAY**, Chief Engineer
Cleaver-Brooks Company,
Milwaukee, Wis.

THE PACKAGED fire tube boiler, introduced about 30 years ago, has since gained great popularity. A good deal of its acceptance has been due to research and engineering in development of full sequencing and controls, which were applied commercially about ten years ago.

About ten to fifteen years ago most boilers were started and sequenced manually. The basic flame-failure control was a stack switch, a bi-metallic device designed to sense changes in stack temperature. Flame presence was proved by a rise in stack temperature. If flame was extinguished, the control reacted to the drop in stack temperature.

Because stack temperatures do not increase or decrease rapidly, this control is slow to react to any malfunctions of firing. The trial-for-ignition period of the stack switch was usually 90 seconds, and often longer. This period is defined as the length of time that the combustion safeguard permits the main burner fuel valve to be open before the flame-sensing device is required to detect the main flame. With the stack switch, fuel was allowed to enter the firing chamber during the trial-for-ignition period whether flame was established or not. On flame failure, the fuel valve remained open for anywhere from 30 to 90 seconds before a drop in stack temperature caused the stack switch to effect a shutdown.

Stack switches were applied only to oil-fired units.

As gas developed into an important fuel, a control was designed which would be able to detect a flame more quickly. This control used a flame rod to detect the gas pilot and main gas flames, and a photocell for an oil flame. The flame-failure response timing was fast—2 to 4 seconds.

The trial-for-ignition period depended upon a bi-metallic safety warp switch built within the control. This timing was set for 35 to 55 seconds. When shorter timings were necessary, auxiliary time relays were used.

Because the control was designed primarily for flame-failure requirements any sequencing needed had to be accomplished by additional relays. Field experience also indicated that flame rods often were troublesome.

For combination burners, the use of two types of sensing devices meant a longer switchover time from gas to oil or vice versa because one had to be removed before the other could be put in place.

Basically this control was developed for automatic domestic and commercial applications, but because of the absence of any other suitable control it also was applied to industrial units.

Because of difficulties which the industrial user experienced, a control eventually was developed primarily for his use. It is believed that the resulting control, herein described, answers most of the industrial user's problems.

Control required was quite complex since the control system of an automatically-fired boiler is primarily designed to program all burner and accessory functions, from the lighting stage to shutoff, with maximum safety. With this new control, fast and reliable flame and ignition-failure protection was obtained. In addition, complete automatic sequencing was available in the same control.

This feature eliminated many accessory devices, such as timing relays and magnetic relays, and presented a single source of responsibil-

About the Author

Paul E. Buday has been associated with Cleaver-Brooks ever since he graduated from Marquette University in 1948 with a degree in electrical engineering. He was appointed chief engineer of their Fire Tube Boiler Division in 1960 after having served previously as chief electrical engineer, production engineering supervisor, and assistant chief engineer. Mr. Buday is a member of the AIEE, the American Boiler Manufacturers Association, and the Engineers Society of Milwaukee.

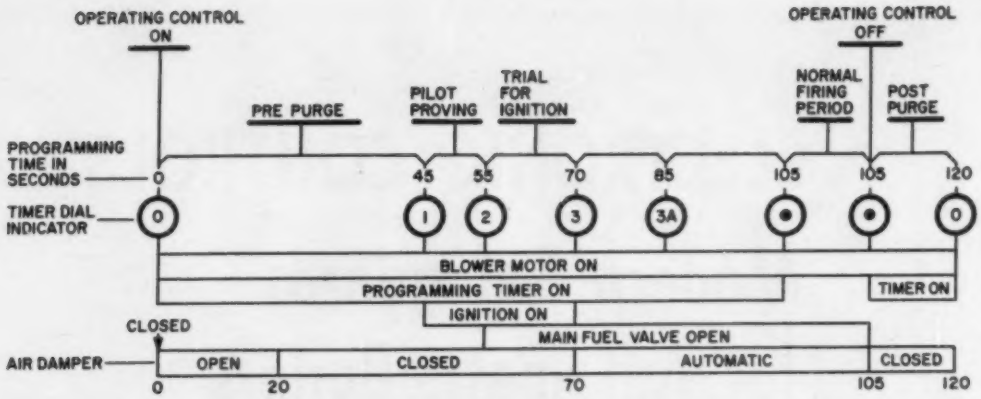


Fig. 1. The modern control sequence of operation for automatic cycling of packaged boilers, as diagrammed.

ELECTRONIC CONTROLS

ity for complete sequencing and flame-failure protection.

The industrial control also performed the same function as flame rods and photocells. Here was a single device suitable for detecting both oil and gas flames. The scanning device uses lead sulfide which has the property of changing its resistance when exposed to infrared rays. It is an established fact that all flames emit infrared rays. It has also been proved that these rays are emitted at a frequency of between one and several hundred cycles per second.

The electronic circuit which was developed accepts all signals of infrared frequencies detected by the lead-sulfide cell and then uses only those whose frequency is approximately 10 cps (cycles per second). This signal is then amplified and used to energize a flame relay. With this tuned circuit we assure ourselves that the cause of flame pull-in is actually flame and not hot refractory. Hot refractory, which is basically a d-c type of light source, cannot cause flame relay pull-in. This eliminates the false indication of flame presence.

Operation Sequence

Also provided with this new control is the complete sequence of operation required for an automatic cycle. This is shown in Fig. 1. Sequencing is controlled by synchronous timing motor which is geared to one complete revolution every two minutes. A two-minute cycle was chosen because the desired sequence could be completed in this time.

On the shaft of the timing motor a series of cams is mounted so they rotate with the motor. These cams are cut into various shapes so that as they rotate they make and break a series of electrical contacts thereby energizing and de-energizing certain circuits. These circuits in turn are connected to the proper electrical control on the boiler. A typical panel installation is shown in Fig. 2.

By using a timing motor, which is unidirectional, the sequences will always be the same from cycle to cycle (see Fig. 1). The combustion safeguard provides the following sequences in their proper order:

1. Guaranteed Low-Fire Start. On all units where burner firing can vary from low fire (approximately 33 per cent of full firing) to high fire (full rating) any attempt at lighting-off should be done in a low-fire position. Integral with the control is an isolated switch which is wired into the boiler circuit in such a way that the modulating motor will be electrically driven to a low-fire position. After the boiler has been safely lit, this circuit will reverse so as to allow cycling to demand position.

2. Pre-Purge (45 seconds). Before restarting any unit, all unburned gases which may be present in the firing chamber should be cleared before ignition is introduced. The isolated switch which was used to drive the damper motor to low fire in Step 1 is also used to drive motor toward high fire during pre-purge. After a period of 20 seconds, the switch reverses and drives motor back to low fire. The purpose of this action is to increase the amount of air delivered during pre-purge. The control allows a full 45 seconds for purging—which gives at least four complete air changes and, in many cases, more.

3. Pilot Proving Period (10 seconds). After the pre-purge period, the ignition transformer and solenoid pilot valve are energized, thus establishing a pilot. During this 10-second period, the pilot is stabilized and proven by the scanning device. Unless the pilot is large enough and proven at the end of the 10-second period, no further action will take place.

4. Trial-For-Ignition Period (15 seconds). If after 10 seconds of pilot proving, now 55 seconds after startup, the scanner still "sees" pilot, main fuel is introduced into the firing chamber and an attempt to light is made. Main fuel may be either oil (heavy or light) or gas since the sequence is identical with both. Although light-off usually occurs immediately, a 15-second period is allowed. This is the maximum allowed by recognized approval agencies on gas and light oil. Although on heavy oil a 60-second trial-for-ignition is normally allowed, 15 seconds is generally accepted as maximum needed. The control can be wired for a period of 30 seconds.

5. Cycle To Demand Position. At the end of the trial-for-ignition period, two things occur:

A—The interrupted pilot is extinguished. The scanning device continues to monitor, but now only monitors main flame, providing complete main flame-failure protection.

B—The guaranteed low-fire start circuit provided for at the beginning

of the cycle now switches, allowing the boiler to cycle to demand position.

6. Post-Purge Period (15 seconds). After the boiler has completed its demand cycle (normal operating time), a post-purge cycle is provided. All unburned gases are expelled preparatory to the next restart. During the post-purge period, the guaranteed low-fire circuit again switches, insuring a low-fire start at the next cycle.

Should an ignition or main flame failure occur any time during the cycle, a safety shutdown occurs. This is accomplished by providing a bimetallic element in the control circuit so that the scanning device is heated any time it does not see flame. After approximately 60 seconds, the safety switch trips open, requiring manual reset. This is a very desirable and essential feature since the operator should investigate the source of failure before any relighting is attempted.

Application

The flame-sensing scanner is designed to serve a dual purpose as follows:

1. To sense an adequate pilot to ignite the main flame reliably.

2. To supervise main flame from startup to shutdown.

In order for the scanner to sense an adequate pilot it must be located carefully. Correct and incorrect locations are shown in Figs. 3 and 4, respectively. The location must be one which will not allow detection of a pilot too short to ignite a main flame reliably. To insure this, a minimum pilot test must be performed on every new application. In this test, the pilot is reduced in size until the scanner can just pick up the pilot signal. This is shown in Fig. 5.

At this point, the pilot must ignite the main flame reliably. If this cannot be done, the location of the scanner must be changed to insure a larger pilot.

Because a small amount of lead sulfide is required to perform the flame-sensing duties, the scanner is quite small. This feature allows the entire scanning device to be mounted into a ½-in. pipe, and therefore the correct location is not a major problem.

When a flame rod is required to detect a gas pilot, and a photocell to detect oil fire, the minimum pilot test cannot be performed since the flame rod cannot extend into the oil flame. Therefore, it is possible to prove a pilot which will not ignite main flame reliably.

It has been shown how an adequate pilot is detected for safe and reliable ignition of the main flame. Now, for the flame-sensing device to accomplish its second purpose, to monitor the main flame until shutdown, the pilot must be shut off.

If the pilot were allowed to remain on continuously, the scanner could not distinguish between pilot and main fire. Therefore, it would be possible for the scanner to allow continuous operation without the main flame being present. This could result in unsafe operation because the main fuel would be introduced continuously, but not burned. A pilot which is turned off after its function

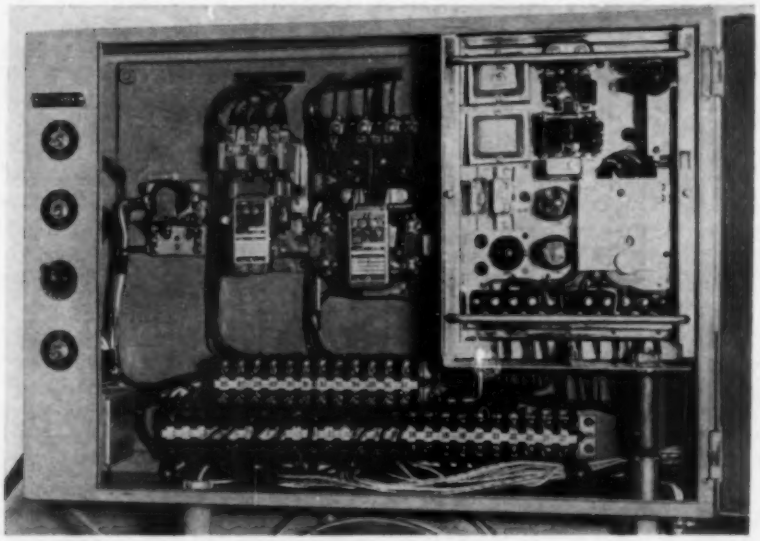


Fig. 2. Above: View inside the panel box of a modern sequencing control.

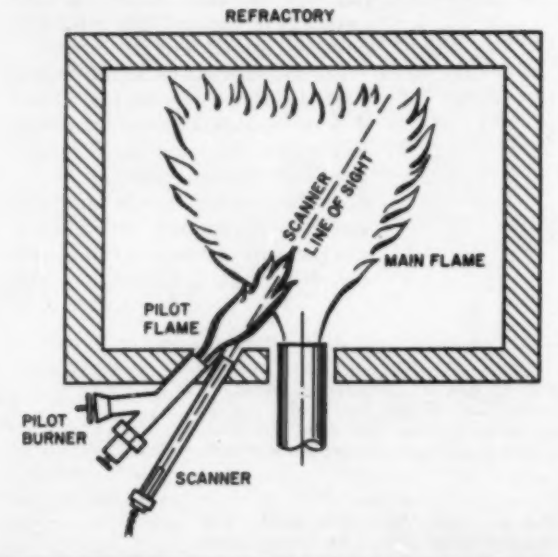


Fig. 3. Left: This diagram shows the correct scanner location. Here the scanner proves the large pilot which will reliably ignite the main fuel.

is completed, namely main-flame ignition, is called an interrupted pilot. It is generally accepted that the interrupted pilot is the most satisfactory and reliable type available.

Another feature required of all electronic flame-sensing controls is the internal "safe-start component-check" circuit. Component-check circuits are circuits within a control which act to limit continued operation of the control unless it is functioning normally as intended. The ultimate in combustion safety-control design would be a system which could not fail unsafely or which would, under any circumstances, instantly detect any component failure and react in a safe manner. It is not possible from a practical standpoint to build such a system since any manmade device is to some degree susceptible to unpredictable failure in time.

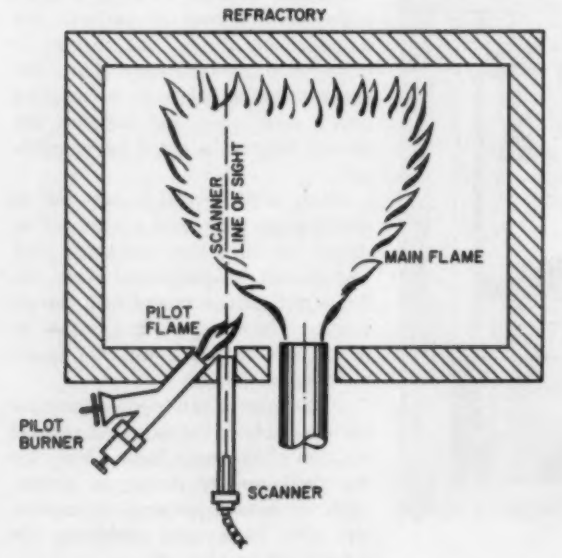
Apply this fact to a combustion safety control, and it is clear that relays may fail to open or close, resistors or capacitors may short or open, and electron tubes may fail in several different ways. It becomes apparent, therefore, that a control has merit according to the degree of safety which it provides.

If the flame relay of a combustion safety control were to stick in its closed position or be maintained by other component failure or flame simulation, and flame failure were to occur within that operating cycle, the fuel valves would not close and there could be unsafe discharge of fuel into the combustion chamber.

If, however, flame failure did not occur before a normal limit shutdown and the flame relay was so interlocked in the circuit as to require its being in a normal de-energized position before a new cycle could be initiated, then further operation of the burner without flame-failure protection would be prevented. Obviously, this feature, which immeasurably increases the degree of safety, should in no way be nullified by improper application.

When combustion controls are used in applications of continuously burning pilots, the safety control remains completely energized as long as the pilot is continuously detected. Thus, the self-check circuit does not receive an opportunity to function, and unsafe component failure may go undetected for days or weeks. If flame failure were to occur during this time and went undetected, large quantities of combustibles could easily be discharged into the furnace.

For optimum safety, an interrupted pilot should be used in conjunction with combustion safety controls. With this system only main flame is monitored. This insures detection of possible main flame failure and also gives the opportunity for the self-check circuit to function before each new firing cycle is initiated. **End**



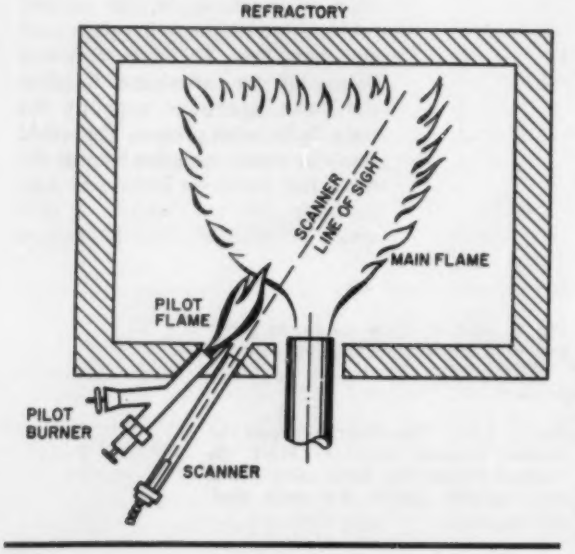


Fig. 4. Above: Incorrect scanner location. Although the short pilot would be proven, this does not mean that it is adequate to ignite main fuel.

Fig. 5. Left: Minimum pilot. The shortest pilot proven by this scanner will still ignite the main fuel supply.

CONSTRUCTION SPECIFICATIONS

By R. E. WALLIN, Chief Engineer, Construction, Plant Engineering Dept., Joseph T. Ryerson & Son, Inc., Chicago, Ill.

GLASS AND GLAZING

This section of the specifications is not all-inclusive since glass for movable partitions and railing tops, curved and tempered glass for doors, mirrors, and glass for other items is furnished under the section covering such items. To avoid delays and extras, excluded items should be outlined under this heading, and a check should be made to determine that these omitted items are included in the other respective sections.

MATERIALS. Hereunder, the architect generally states that all glass shall be new, of type, grade and thickness which he proceeds to spell out in separate paragraphs covering all items. He also states where each item is to be installed.

Similarly, he specifies the kind and brand names of putty and/or glazing compounds which shall be used, as well as the type of glass and glazed units with which each material shall be used.

INSTALLATION. Glass for exterior wood window sash should be bedded in putty, secured with zinc glazing points, and face-puttied.

Glass for entrance doors, entrance transom, and that in metal window frames and steel sash should be bedded in putty and held with metal moldings or clips and putty.

Care should be taken to insure that glass will be completely bedded in putty and will not have contact with frames, sash stops, or moldings. Face putty should be applied in a neat manner and shall show no knife marks or other blemishes.

BREAKAGE. It should be stated that all glass should be protected against damage or breakage at all times. Glass which may have become broken or damaged in any way from any cause whatever during construction, and any glass which is scratched or otherwise defective, should be replaced without additional cost to the owner. Any putty which has been damaged during construction should be replaced or patched without additional cost to the owner.

CERAMIC TILE

SCOPE. Our typical building project included the following ceramic tile work in the office building: wainscots in first-story men's and women's toilet rooms, floor in first-story vestibule, floor of landings of front stairs, floor in second-story plant men's toilet rooms, locker rooms and shower rooms, janitor room, gutter and door curb for second-story plant men's shower rooms, and cove base in second-story plant men's locker rooms, and janitor room.

MATERIALS. Natural clay-type tile was specified for the floors and glazed-type for the walls.

All floor tile was required to be cushion edge and of random pattern made up of 2 in. x 2 in., 1 in. x 2 in., and 1 in. x 1 in. pieces, except in front stair landing and vestibule where pattern was to be made up of 2 in. x 2 in. only.

Wall tile was called for as glazed interior wall tile in 4¼ in. x 4¼ in. cove base at the bottom. Colors and patterns were selected by the architect.

Tile for gutters and door curb for shower room was requested to be golden range color with 1-in. radius cove and cap pieces to form horizontal and vertical corners.

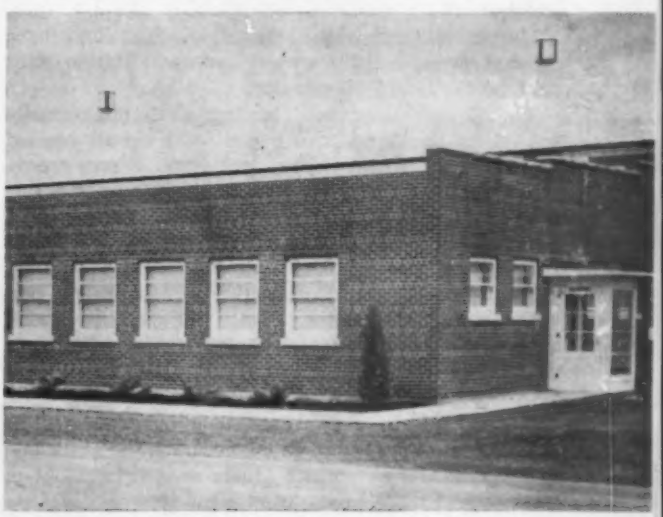
Base in locker and janitor rooms was required to be 6-in. cove and bullnose top, in color and texture to approximately match the tile.

INSTALLATION. Floor tile should be set on solid beds of mortar mixed of portland cement and clean, sharp, torpedo sand, and the tile should be bedded in and the joints filled with portland cement grout.

The total thickness of the beds generally is about 3½ in., applied above the dampproofing membrane on first stories, 2½ in. on the upper stories, and as detailed on the plans for upper story shower rooms and stair landings.

Walls which are to receive wainscot tile should be

Fig. 1. Extremely functional, but unglamorous, glazing should be correctly specified to produce desired results.



given a scratch coat of portland cement mortar, and then tile is set in portland cement grout applied to the scratch coat.

Floor work must be laid level, in uniform pattern and joints, with joints in alignment, and with all joints filled.

Wainscot work should have plumb, level courses, with uniform and perfectly aligned joints, and with all joints grouted with white portland cement.

In the above we have specified the old, conventional mortar method using portland cement set in a bed with waterproofing under it all and with metal reinforcing in the bed. It is felt this is still the best method where most protection against moisture is required and the work is subjected to heavy use or is located outdoors.

Another way of installing tile over concrete, cinder, or slag block, brick, asbestos board, cement plaster, and such other materials is known as the dry-set portland cement mortar method, done in the manner recommended by the cement manufacturer.

A third way used in dry areas over wood, masonite, metal, gypsum board, and other such materials is known as the organic adhesive method.

The architect or engineer should decide and specify the method to be used.

CLEANING. On completion, the work should be washed down and cleaned, and all areas left in perfect condition.

MARBLE WORK

Marble has been used by man in building construction through the centuries. It is employed for aesthetic effects in lobbies, corridors, etc.; it is also specified for other application in buildings where utility and low maintenance cost are desired.

In our typical building project we specified marble for wainscot in the washroom showers, for stair treads and landings, and for stools at the windows.

MATERIALS. The specifications should state that all marble must be an approved color as selected by the architect.

Marble wainscot should be ⅞-in. thick and have polished finish on all exposed surfaces. Marble slabs must be full height of wainscot.

Marble stair treads and landing platforms normally are 1¼-in. thick and have honed finish on all exposed surfaces with ¼-in. Carborundum strips in stair treads.

Marble stools should be 1¼-in. thick, have top surface and all exposed vertical edge surfaces polished, and be provided in single lengths when possible. If joints are required, they should be centered on sash mullions.

INSTALLATION. All marble work should be performed in strict accordance with the procedures and methods as set forth in the Standard Specifications of the Marble Institute of America, Inc., which should form a part of the specifications covering marble work.

Only sound and satisfactory stone should be set. It is important that all units be cut accurately to shape and dimensions with all corners square and surfaces out of wind and at right angles to adjacent surfaces.

Marble wainscot in shower rooms must be set with concealed brass setting-wire anchors secured in the masonry wall backing and by spot back-up, using gauging plaster. Enough anchors should be attached to render the installation secure. Joints should be fully buttered with cement or with nonstaining mastic as each slab is set. Particular care must be taken to provide fully filled joints between slabs in shower room wainscot.

Joints between marble slabs should not exceed 1/16 in.

Marble wainscot must be set as detailed on plans.

Marble treads and steps should be set with concealed brass setting-wire anchors secured to the steelwork and in a full bed of mortar.

It is important that the marble contractor cooperate fully with other trades, including cutting and drilling as may be required to accommodate their work.

All stair and landing marble work should be fully protected with Sisalkraft reinforced paper, or equivalent. All damage caused by carelessness of workmen performing marble work should be repaired at the expense of the marble contractor.

LATHING AND PLASTERING

In our typical building project there was very little plastering—none at all in the plant building. In the office building the ceilings were principally acoustic tile, and the walls were masonry and marble.

In the old days when wood framing and wood lath were widely employed, plastered areas were what they were "cracked-up to be," and year after year more cracks appeared as the wood moved with the seasons. Today, however, with steel studs, steel runners, steel furring, steel lath, and steel accessories available, and by taking advantage of new techniques in detailing, plastered surfaces can be made to provide a good, permanent finish free from cracks.

LATHING. Unless otherwise specified or detailed by the architect, ceiling plaster should be applied over standard 3.4 lb black dipped expanded metal lath wired to ¾-in. steel channels spaced 12 in. on center. In toilet and shower rooms all metal should be galvanized.

The ¾-in. steel channels should be wired to 1½-in.

Fig. 2. In this washroom, specifications called for ceramic tile floors, with ceramic tile full height on walls.

runner channels spaced not over 4 ft on centers. The runner channels should be supported by "pencil rod" hangers attached securely to the structural construction above so as to fully support the ceilings. In toilet and shower rooms all these materials should be galvanized.

PLASTER. Plaster areas should be laid up of scratch, brown, and finish coats, except in the boiler room where the finish should be omitted—(a) scratch coats are generally mixed of one part gypsum cement and two parts clean plaster sand; (b) as a rule brown coats are mixed of one part gypsum cement to three parts clean plaster sand; (c) a good finish coat can be mixed of one part lime putty and three parts Keene's cement by volume. Plaster coats should be well troweled for proper key and bond. Finish coat should be troweled to smooth, hard surface.

CLEANING. The operation of plastering is messy, and cleaning up is important. The premises should be kept clean and free of droppings and rubbish when the plastering contractor's work is in progress. On completion of the work, the floors in plastered areas should be broom cleaned and completely cleared of droppings and surplus materials.

Fig. 4. Lathed and plastered wall features steel studs, runners and lath, with painted steel base.

ACOUSTICAL CEILINGS

SCOPE. In our typical project we specified that suspended acoustical ceilings were to be installed in all areas except the boiler room, toilet rooms, locker rooms, recreation room, and front stairways on first and second stories.

MATERIALS. There are numerous types of acoustical materials on the market at various prices to suit different ceiling construction surfaces. Acoustical ceilings lower sound levels and improve working conditions.

In our project the acoustical ceilings were constructed of perforated metal-faced acoustical units in 12 x 24-in. size, each unit grooved across the center to stimulate 12 x 12-in. tile, with faces factory finished.

Each unit must contain a special sound-absorbing element, the back and sides of which are encased in asbestos or burn-proofed paper. The face of the element which is exposed to the perforated metal should be covered with muslin, and the element must be spaced away from the metal by painted metal element supports.

Inserts, hanger rods, channel runners, clips, and metal tee bars for suspension of the ceiling are to be standard products of the manufacturer supplying the units.

INSTALLATION. The acoustical units should be held in place by formed steel tee bar runners, shaped and spaced to fit and hold the units and permit easy removal of units when desired.

Tee bars must be clipped to ½-in. steel furring channels spaced on not more than 4-ft centers. Furring channels should be substantially supported from structural construction above by means of heavy wire in accordance with standard practice.

For the wall, column, and pilaster sides of all areas, formed sheet steel channels, painted to match the units, are to be installed to receive tile edges.

The entire suspension assemblies should be rigid in construction, level, in alignment, and of sufficient strength to carry the ceilings and lighting fixtures.

The areas must be laid out to avoid small cuts and to provide symmetrical patterns. Units should be cut along walls, columns, and pilasters as required. They should also be fitted around electric wiring outlets, heating pipes, ventilating outlets, etc., in a neat, workmanlike manner.

Prior to installation, the units should be carefully stored and handled to avoid damage. Workmen should wear clean, white canvas gloves when handling the units.

CLEANING. Acoustical units shall be kept as clean as possible during installation, and on completion of the work any dirt stains or fingermarks shall be removed.

Fig. 3. Here, washroom design called for marble wall facing, toilet partitions, base and step. Floor is ceramic.

ASPHALT TILE

SCOPE. In our typical building project we specified asphalt tile and stated that it was to be used on the first and second story main office floor areas (except in private offices, toilet rooms, and vestibule in the first story, where carpeting or ceramic tile would be used; and storeroom, janitor, locker, shower, and toilet rooms in the second story, where plain concrete or ceramic tile would be used.)

We also specified that base was to be provided for

wall sides, including sides of ceiling-high stationery cases, in all areas where asphalt title is laid, except sides of metal partitions and railings.

MATERIALS. Asphalt tile comes in various thicknesses and sizes. We specified ⅛-in-thick, 9 in. x 9 in. size, laid in checkerboard pattern, in colors as selected by the architect, using "C" group colors. The contractor was asked to state the amount to be added if "D" group were selected and the amount to be deducted if "B" group were selected by the owner.

INSTALLATION. Cement floors on which tile is to be laid must always be properly cleaned before starting the work. Preparation should include scraping or chipping off lumps of concrete, plaster, or other materials, possibly grinding high areas which may be too rough or uneven; and filling holes, hollow spots, and low, rough areas. Tile should only be laid on smooth, level surfaces so there will not be highlights in the finished floor.

The tile should be laid in the adhesive recommended by the manufacturer of the tile. Each tile must be firmly embedded. It is important to lay the tile with joints tight and in perfect alignment, and with flush top surfaces.

Extruded aluminum edge strips should be installed at all doors, and where asphalt tile floors join floors of other materials.

All cutting and fitting required to lay the tile should be done with care and in a neat, tight-joint manner.

CLEANING. Just prior to occupancy by the owner, the covered floor areas should be cleaned of dust, dirt, and foreign materials and given a coat of self-polishing wax of approved brand.

METAL TOILET PARTITIONS

The architect normally shows and details metal toilet partitions on the drawings with full information and dimensions and with supplier specified.

The supplier should take accurate field measurements and prepare shop fabricating drawings, which must be checked and approved by the general contractor and architect before the parts are fabricated.

For our construction project we specified ceiling-hung partitions for all toilet rooms in both the first and second stories as shown on the plans. This type permits free sweeping and mopping of the floors, thereby enabling the rooms to be kept more sanitary.

MATERIALS. The steel sheets for panels should be cold rolled, galvanized, bonderized, stretcher-leveled, or furniture stock steel. No. 22 gage steel door plates, No. 20 partition panels, No. 18 and No. 16 pilasters, No. 14 hooks and reinforcement, and No. 12 anchoring devices are used for the various parts which make up the partitions.

The cores of good partitions are made of at least six plies of corrugated fiberboard, interlined, faced with sheets of chipboard, all thoroughly glued and compressed to 1 in. for doors and panels, and of at least seven plies to make 1¼-in. for pilasters.

Good brackets are made of cast or extruded brass, satin chrome finished, held in place with $\frac{3}{16}$-in. satin chromium finish brass hex bolts.

SUPPORT. Pilasters must be supported at the top by built-in welded anchoring devices designed to transmit the strains of lateral thrust and pull to the structural frame independently of the finished ceiling.

FINISH. Good finish will include spraying one coat of primer and two color coats of enamel, each coat oven baked at a temperature in excess of 275 F. The color to be as selected by the architect.

HARDWARE. Under this heading the architect should specify the different kinds of plain, heavy pattern, wrought, extruded or cast brass hardware items, in satin chromium-plated finish, that are needed to assemble the parts, using $\frac{3}{16}$-in. chromium finish hex bolts.

Combination hook and bumper units with a minimum projection of 3⅛ in., and a base of not less than 1½ in. in diameter, should be mounted approximately 3 in. from the top edge and 6 in. from the swing edge of the door, on the dividing panels of each compartment.

A much appreciated accessory is a spring-type utility shelf in satin chromium finish, 5½ in. x 13¼ in., installed in each compartment on the dividing partitions 6 in. in from the pilaster and 3 ft 6 in. up from the floor, on the strike side of the door, by means of a mounting bracket. These furnish the occupant a place to lay articles which otherwise would have to be laid on the floor. See Fig. 5.

It is a good idea to provide two chromium finish toilet paperholders for each compartment. These can be mounted back to back on dividing partition of the compartment. This assures a constant supply of paper.

ERECTION. The partitions must be erected in a rigid and substantial manner, straight and plumb, with horizontal lines level.

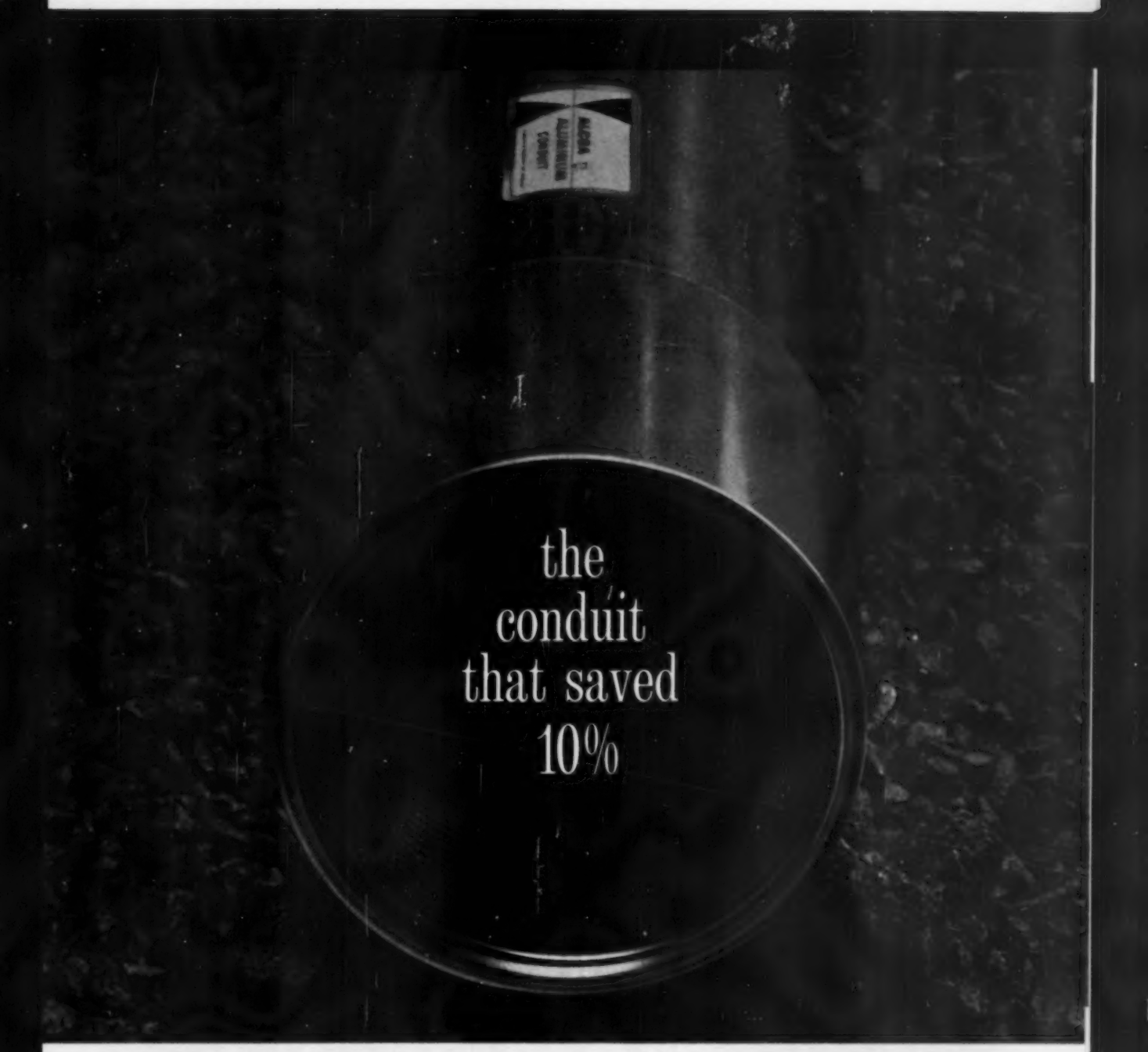
The hardware should be installed neatly and accurately in the specified locations.

All evidence of drilling, cutting, and fitting should be fully concealed by the parts installed over it.

Doors must be hung out of wind with uniform clearances from top to bottom and not exceeding $\frac{3}{16}$ in. on vertical edges. Hardware should be carefully adjusted and in perfect working order.

Surfaces should be left clean and free from imperfections. **End, Part VII**

Fig. 5. Metal toilet partitions specified as in text. Utility shelf (shown up and down) is functional accessory.



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Circle 567 on postcard, page 33

A Plant Engineering DESIGN FEATURE

INCREASING THE OUTPUT OF AN AIR COMPRESSOR— By Supercharging and Precooling

By **JOHN G. HOWELL**, Mechanical Engineer
Pacific Coast Division, Owens-Illinois, Oakland, California

THE IDEA OF supercharging air compressors to increase their output is perhaps as old as the industrial use of compressed air itself, yet it is probable that few engineers who have toyed with the idea have ever found it practical to carry through to the extent of obtaining a significant increase in plant capacity by supercharging.

At least that was the case in our West Coast glass container plants up until last year when we actually completed the installation of a supercharger blower to add 1 psi to the inlets of two 350-hp air compressors that discharge at 45 psig.

Previously our excursions into supercharging had been limited to installing low pressure fans on compressor inlets to reduce inlet noise and improve inlet filter performance. These installations had been limited to increasing inlet pressure by 2 to 3 in. of water. While successful in dampening pulsations and reducing the objectionable noise, they did little to increase the output of the compressors.

In 1960, we were faced with the need for additional air compressor capacity, which we reasoned might be obtained in several ways: (1) by installing an additional 125-hp compressor, (2) by supercharging the present compressors, (3) by installing a precooling dry air system that shrinks the air entering the compressors so that a greater weight of air goes through the compressors, and (4) by a combination of supercharging existing compressors and precooling the intake air.

Supercharging and Precooling

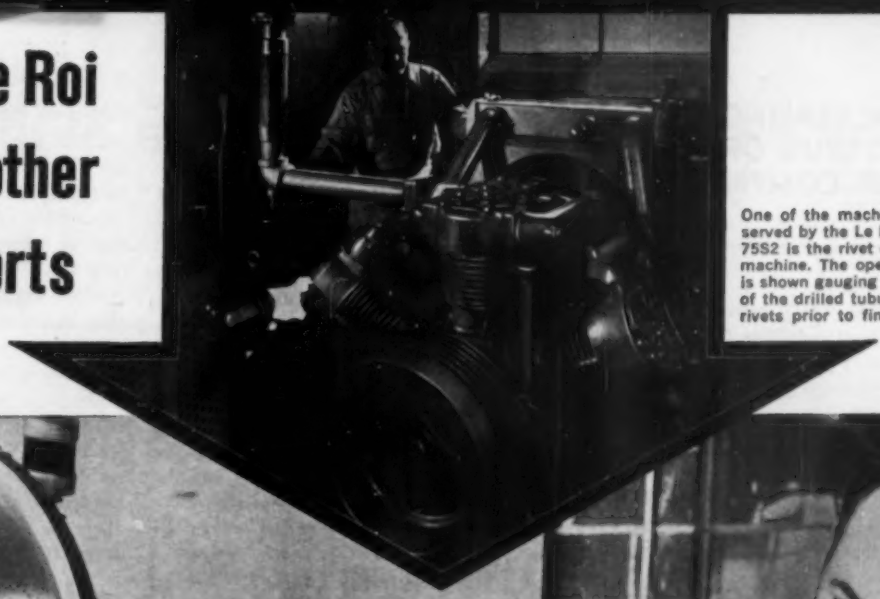
Due to a special set of circumstances, our analysis indicated that the latter procedure would provide the same additional capacity as that of the air compressor which we had selected and that it might be installed and operated at little or no premium over the cost of a new compressor. In addition, the added advantages of a precooling dry air system, which removes the objectionable moisture prior to its entering the compressors and which also reduces the air discharge temperature so as to minimize the breakdown of the lube oil, we felt would more than offset any possible extra cost.

Furthermore, this was a realm of engineering that had not been too well explored and, even though the principles were fundamentally sound, there might be other desirable features of which we were not immediately aware and which might be of even greater advantage to our larger compressed air installations on the West Coast where the prevailing humidity conditions year round make precooling systems particularly attractive.

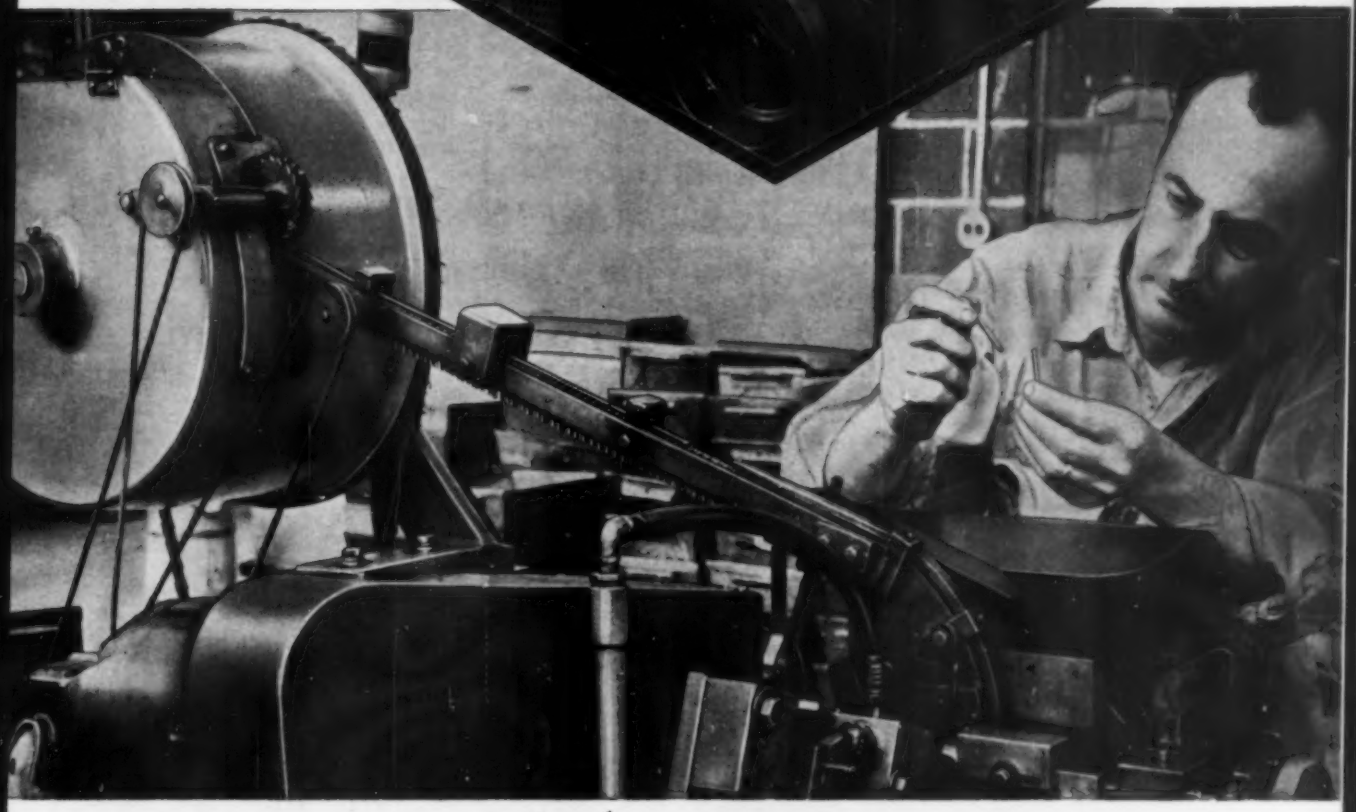
The basic objective at one plant was to increase the effective output of the original compressors from a nominal of 5220 scfm up to approximately 6050 scfm—a 16 per cent in-

Readers may recall a previous article by this author "Vapor in Compressed Air—Make It Work For You, Not Against You" which appeared in the September 1959 issue of Plant Engineering.

One good Le Roi leads to another ...user reports



One of the machines served by the Le Roi 75S2 is the rivet drilling machine. The operator is shown gauging one of the drilled tubular rivets prior to finishing.



LE ROI 75-HP STATIONARY COMPRESSOR

First air-cooled Le Roi finishes 5 years of service with just routine cleaning and oil changes!

Shown above is a Le Roi 75S2 compressor recently installed at John Hassall, Inc., Westbury, Long Island, manufacturer of job-designed fasteners and parts.

Picking Le Roi came naturally when Hassall found need for additional air power. Their last Le Roi has worked for five years without trouble, and has required only filter cleaning and oil changes for upkeep.

Hassall was convinced they could save 30% on installation, get more air from less space, and reduce maintenance time about 40% if they installed the air-cooled Le Roi 75S2 rather than a water-cooled air compressor.

Moreover, Le Roi compactness permits installation *near the point of use*, with less piping and air loss. Air-cooling eliminates costly plumbing and water-line freeze-ups... permits indoor or outdoor installation. Dual control gives you constant speed or automatic start-stop operation.

Pick Westinghouse unit-type or Le Roi stationary air compressors for your needs. Sizes from ½ to 100 hp. See your Le Roi distributor, or write to Le Roi Division, Westinghouse Air Brake Co., Sidney, Ohio.

SC-07

LE ROI STATIONARY COMPRESSORS

PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

Circle 568 on postcard, page 33

INCREASING THE OUTPUT OF AN AIR COMPRESSOR

crease. This increase was to be obtained as follows:

a. Precooling from a high of 90 F atmospheric temperature down to 40 F
or $\left(\frac{90 - 40}{460 + 40} \times 100\right)$ to give an increase in the capacity of 10%

b. Supercharging this air by 1 psi: $\frac{1}{14.7} \times 100$ to give an increase of 6.8%*

For a total increase of 16.8%

*There is a further increase of about 1 to 1½ per cent due to an improvement in compressor volumetric efficiency that results from supercharging by 1 psi. This figure was not considered in the initial calculations, however.

In selecting the pressure blower for supercharging, the prime considerations were efficiency, ruggedness and reliability in order that the performance of the blower be as closely comparable to that of a heavy duty reciprocating air compressor. The new Westinghouse pressure blower Model No. 2445-3B with air foil vanes seemed suited to the service. Although it operated at only 1775 rpm it could develop a pressure of over 1 psig with an efficiency of 80 per cent or more.

Another feature of the blower was the overhung construction of the rotor on an especially heavy 40 hp motor shaft. The low speed of 1775 rpm as compared to 3550 rpm also had a great appeal since ball bearings are more dependable at the lower speed. Encapsulating the motor windings permitted the use of the simpler, open, drip-proof type of motor enclosure even for this outdoor installation.

Our calculations indicated that a pressure boost of 1 psi would result in an increase of air temperature of 10 F due to 100 per cent adiabatic compression. To this should be added approximately 2 F due to internal windage and friction loss, which can be calculated by the difference between 100 per cent and the actual efficiency of approximately 80 per cent. The total of 12 F increase required that the dry air cooler be sized to care for this added heat load and still deliver the air to the compressor inlets at 40 F.

Delivering air at a higher than atmospheric pressure to an air compressor means that the compressor does less work per unit volume handled; however, it also means that a fully loaded compressor will use more power because of the increase in the mass of air handled. This can be shown by the following formula:

$$hp = \frac{K\,W\,T\,R}{1 - n}\left[\left(\frac{P_2}{P_1}\right)^{\frac{n-1}{n}} - 1\right]$$

where W is the weight of air handled
T the absolute temperature in degree Rankine
R the gas constant or 53.3 for air
n = the ratio of specific heats or 1.4 for air
P_1 and P_2 the absolute inlet and discharge pressures
(The values of P_1 are 15.7 and 14.7 with and without supercharging respectively.)
P_2 is 45.0 + 14.7 = 59.7 psi absolute
K is the constant of the equation and is equal to 0.00436

The value of the term in brackets is 0.49 without supercharging and 0.47 with, consequently this term decreases the power required by 4.1 per cent as a result of supercharging. On the other hand, the value of W increases 6.8 per cent because of the supercharging. Thus there is a net gain of 2.7 per cent in power required on a fully loaded compressor. With a nominal compressor rating of 350 hp this increase amounts to approximately 10 hp.

Conversely, with two or more compressors in operation, the compressor that is partially loaded will have some of its load removed by the operation of the supercharger. This reduction is equal to 6.8 per cent of the capacity of the fully loaded unit which in this case with a 350 hp unit is approximately 24 hp.

In addition there is a further reduction of 4.1 per cent applicable to the partial load on the swing compressor. If the latter is operating at 75 per cent load without supercharging, then the added decrease in horsepower is approximately 11 hp for a total reduction of 35 hp. Subtracting the increase on the fully loaded unit, the net decrease in compressor loading in this instance due to supercharging is 25 hp.

Adjusting the performance data of the pressure blower for 1 psig, its power requirement at 5000 scfm is found to be approximately 28 bhp. Thus, in this instance there is a net loss of only 3 hp by supercharging. This loss is due, basically, to the

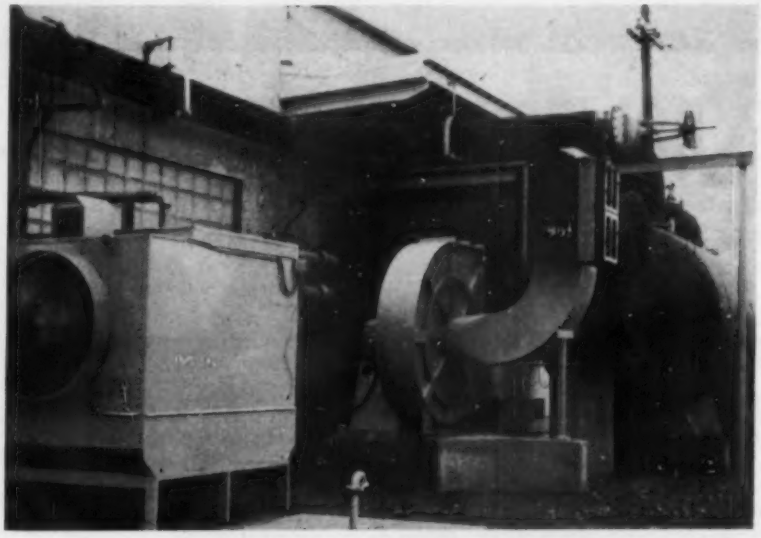


Fig. 1. The blower above discharges into the dry air cooler precooling the inlet air to the compressors to 40 F. The cooling tower is at the left. The refrigeration unit is located inside the building.

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Type L single-stage low-pressure units, with side suction and discharge, cover pressures to 15 psig or vacuums to 22" Hg, in capacities from 100 to 12,000 cfm. Two-stage units can be supplied for higher pressures and vacuums.

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Circle 569 on postcard, page 33

somewhat lower efficiency of a centrifugal blower over a reciprocating compressor. As can be seen, it is inconsequential in this particular case. Actual tests of the system after the installation of the supercharger have closely confirmed the above calculations most satisfactorily.

One plus factor that was not anticipated, however, was that by supercharging by 1 psi, the discharge temperature from the compressors dropped approximately 10 F below that formerly obtained without supercharging. The actual drop was from 315 to 305 F. This reduction in the discharge temperature of the compressed air should, we hope, further reduce the rate at which the lube oil can break down and form carbon and sludge to foul compressor valves and cause leakage and the likelihood of internal air line fires.

Supercharging, without also precooling the inlet air, could result in higher than normal discharge temperture, particularly if the efficiency of the supercharging blower were significantly low. Since the supercharging blower will handle only that amount of air required by the compressors, no dampers or inlet control vanes are required as might otherwise be necessary to limit the horsepower load of the blower.

Inlet vanes would probably be required to prevent objectionable surging if the blower were to be used when the demand for air dropped significantly below 5000 cfm. Since there is no point in operating under such conditions, the vanes were not provided.

Precooling System

While it is not the intent of this article to discuss in detail the operation of the precooling dry air system, a brief description of the dry air cooler is in order. This unit, as installed, consists of a 6-ft-diameter by 12-ft-long tank containing air cooling coils through which chilled water is circulated to produce an outlet air temperature of 40 F. The moisture that condenses on the coils runs down the face of the fins, collects in a pan and then flows to a drain.

Since the dry air cooler is under a pressure of 1 psig a "U" leg trap provides automatic flow for the condensate to the cooling tower and thus supplies some of the makeup water for the tower. The design of the dry air cooler followed the general principles of that developed by Robert C. Coblentz of the Lynch Corporation but as modified to provide for supercharging.

The supercharging pressure blower discharges directly into the center of the dry air cooler which in turn is baffled to provide distribution across the face of the coils. The inlet of the blower is fitted with cleanable viscous type filters to keep the coils of the cooler from mudding up with dust and dirt. The original oil bath filters on the compressor inlets were left in place and are connected by means of a 24-in.-diam. duct to the discharge side of the dry air cooler. A 24-in. butterfly valve on the duct permits bypassing both the cooler and pressure blower if desired.

Tests with and without the dry air cooler in operation readily proved the validity of the increase in compressor capacity that had been calculated from gas formulas. While it is too early to evaluate all of the benefits that might result from dry compressed air and lower discharge temperatures, we feel that they will be significant.

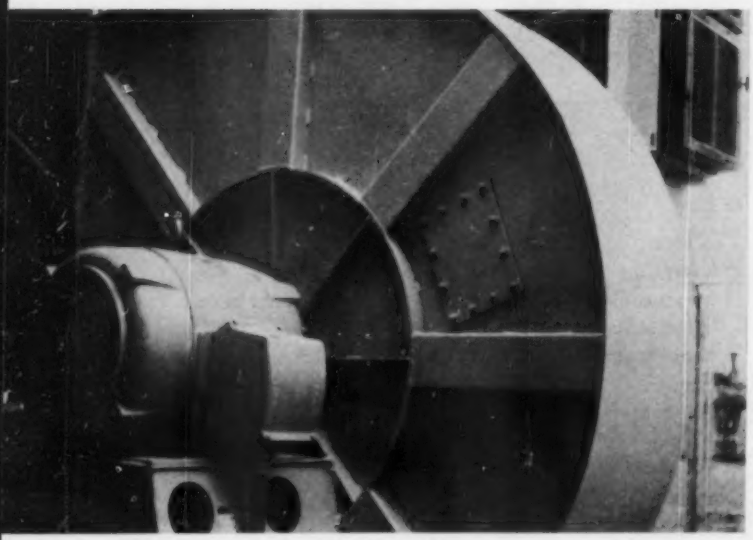
Supercharging also turned out to be a somewhat lower cost method of increasing the equivalent capacity of our compressed air system as compared to actually installing an additional air compressor. For example a 45 psig compressor will cost from $18 to $20 per cfm of capacity installed complete with all facilities. Whereas supercharging was provided at a cost of only $15.50 per cfm of equivalent added capacity.

This is based on $5500 as the estimated cost of that part of the installation assignable to the pressure blower and a gain in capacity of 355 cfm due to supercharging. About $2000 of this $5500 is for the added cost of the larger refrigeration unit necessary to care for the 12 F higher inlet temperature to the precooler because of supercharging. The end result is a further lowering of the compressor discharge temperatures with a lesser likelihood of lube oil breakdown and internal air line fires.

Regarding the cost of operating the system, our calculations as well as tests have shown that less power is required to operate the new system than would have been required by the installation of an additional compressor.

In conclusion, we expect that the savings in power, the freedom from troublesome condensate in the air lines, and the advantages of reduced discharge air temperatures and lube oil breakdown will fully justify this departure from the traditional compressed air installation. **End**

Fig. 2. Closeup of blower that supercharges air compressor intake. Inlet filter is at top right.



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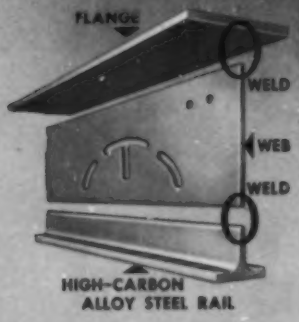

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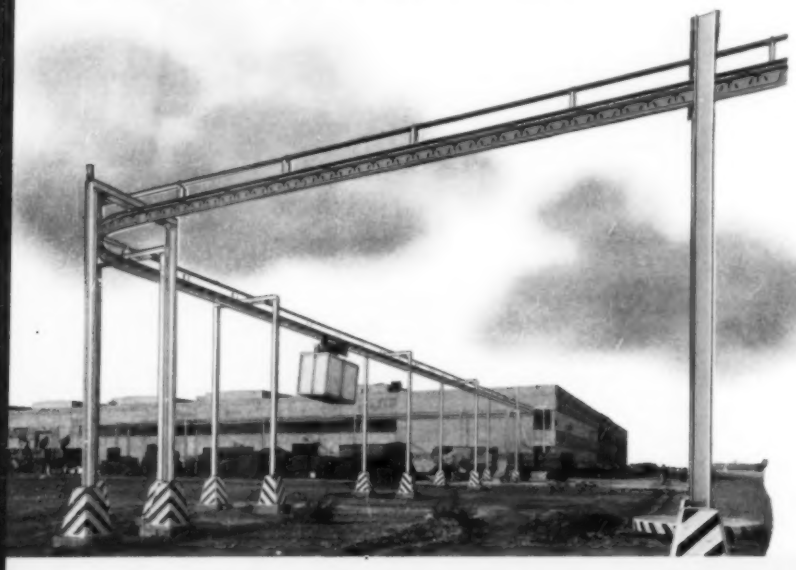

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Arthur L. Rice, Jr., President of Technical Publishing Company, left, looks on as Chet Prouty, Director of Circulation, pushes buttons on control panel of Univac computer, giving it final instructions to process the tabulating cards.

Plant Engineering IS IN SOLID (State—That Is)

Lewis Henry, Remington Rand field engineer, shows Chet Prouty how he checks out computer circuit with help of oscilloscope. Solid state panels in the background consist of transistors, diodes, and gold and silver printed circuits.

IF YOU LOOKED carefully at the label on the wrapper of your October issue of PLANT ENGINEERING, you would have noticed its appearance was somewhat different than it has been in the past. The reason is that PLANT ENGINEERING is now being sent to you with the help of a Univac Solid State 90 computer system.

After eight months of developing programming instructions, with the help of Remington Rand people training our staff and converting circulation lists, we are ready to go "on stream" with our 10-machine computer system.

The first application of this equipment was to prepare magazine mailing labels and galley proof copy lists.

To execute our circulation addressing, we feed a pack of 1600 programming instruction cards into the Reader Unit, which transmits these instructions into the memory drum in the computer. This takes about four minutes.

Next, we feed circulation address tabulating cards into the Reader—then go to the control panel of the computer and push several buttons, giving the computer final directions.

The computer proceeds to send out electrical signals from the memory drum—spinning around 17,670 times per minute—to the Printer Unit, which stamps out address labels and separate galley proofs of addresses at the rate of 600 address lines per minute.

At the same time the computer remembers specific circulation information as to the position of readers it has made address labels for, type and size of plant where the reader works, state location and other information. Then, at predetermined intervals, it directs the Card Punching Unit to punch out circulation analysis cards. Later these cards are put through the computer and five printed copies of this detailed circulation information are produced by the Printer.

This is only one of the jobs the computer will be doing for us. As we develop additional kits of programming instruction cards, we plan to expedite reader service requests, select special mailing lists, handle editorial projects, gather market facts and figures and provide sales analysis information. **End**

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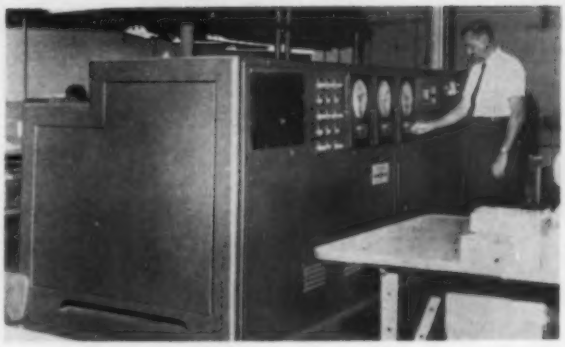
Continuous Conveyorized Vacuum Furnace Is a First for Industry

VACUUM PROCESSING has been put on a fully automated continuous basis, with the installation and operation of a C. I. Hayes vacuum conveyor furnace at the Newark, N. J. plant of General Instrument Corp. This unit is alloying diodes under controlled conditions not obtainable with ordinary processing equipment.

Except for loading and unloading, the entire furnace operates automatically. The worker periodically places "boats" onto an external conveyor which automatically injects them into a vacuum-lock inlet. From here, the work is belt-conveyed through the heat zone where it undergoes processing temperatures up to 1000 C and is then returned to atmosphere through the vacuum-lock outlet.

Set temperatures are maintained within 1 C by means of proportional control instruments which govern three heat zones in the furnace. Experience is proving that the furnace can attain pressures to 5×10^{-6} mm Hg, and maintain operating pressures to 5×10^{-5} mm Hg under load continuously.



General Instrument is processing 34 boats per hour, with 250 to 300 diodes in each boat to achieve a production of 80,000 diodes per shift.

Post-Tensioning Helps Concrete Folded Plate Roof Span 155 Feet

AT INDIANA State Teachers' College in Terre Haute, a prestressed folded plate concrete roof spans 165 ft (155 ft between columns); it is believed to be the longest single span structure of this kind yet built.

The column-free design is used at the school to roof a gymnasium, and provides an open area 210 ft by 155 ft. In addition to this functional advantage, the combination of folded plate design and prestressing is proving economically attractive. Cost of the roof, installed, was approximately $6.36 per sq ft.

The folded plate design consists of eight configurations 26 ft across and 11 ft 6 in. high, extending across the building. To get maximum reuse of forms, a 12-in. construction joint was located in each top flange, and the closure strip cast after the adjoining sections were placed and tensioned. The top and bottom flanges are 12 in. thick, while the inclined sections are 6½ in. thick.

A stiff mix of concrete (2½ in. maximum slump) was required to provide high quality concrete and to facilitate placement on the 45-degree slope of the folds. In addition to metal tendons for prestressing, conventional reinforcement was used. The web sections were placed without the use of a top form.

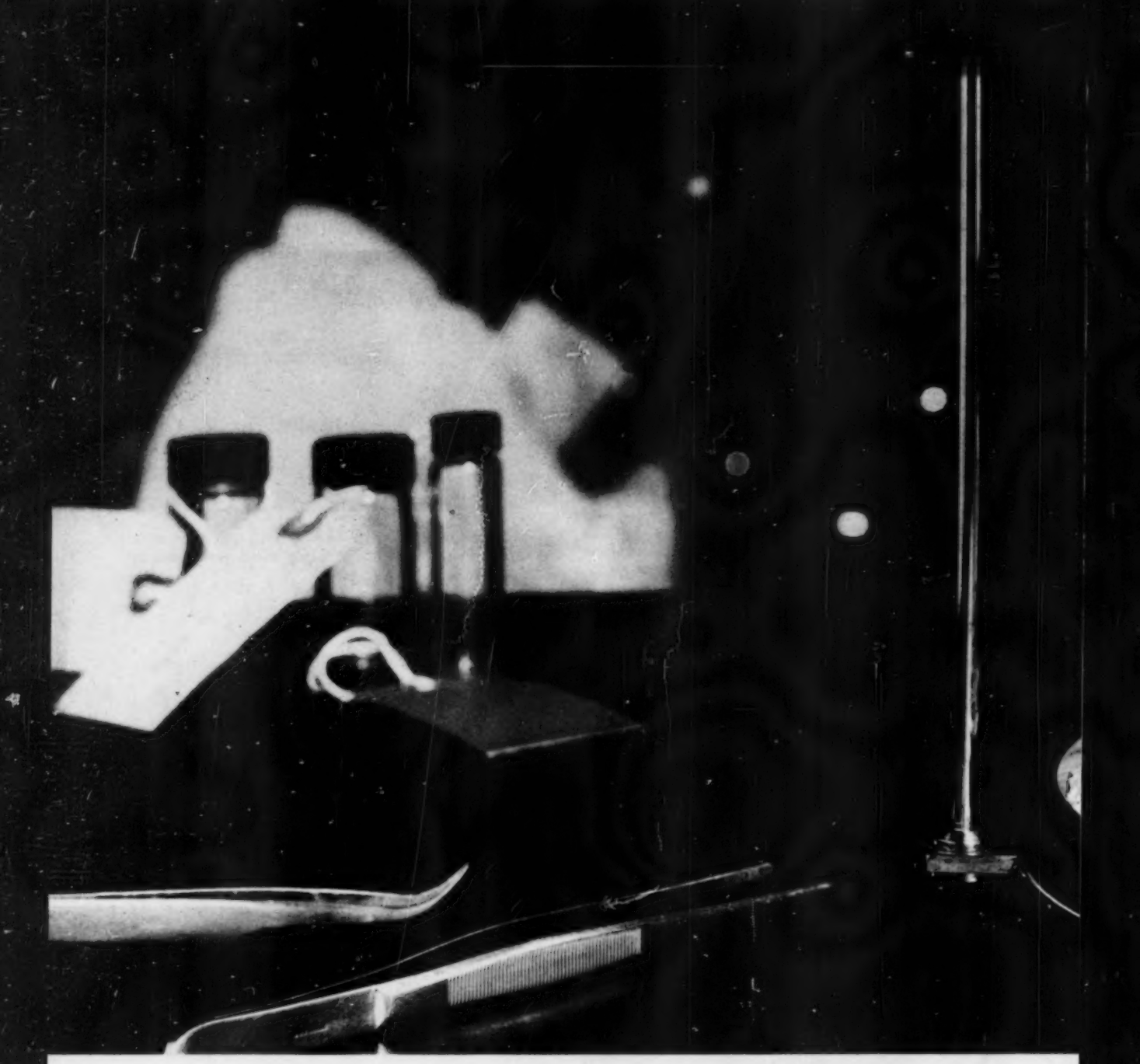
Post-tensioning was used, and a strength of 4000 psi required of the concrete within four days after placement. Except for the two outside bays, each inclined web was equipped with six tendons, one containing 40 wires and the others 28 wires each. The wires, of high tensile steel, were ¼-in. diameter. The Swiss BBRV post-tensioning system was used, and because of the length of the span, alternate tendons were tensioned from opposite ends to equalize the pressure. Each wire received an initial stress of 168,000 psi.

Monomer Casting Process for Nylon Puts It in the "Big Time"

A NEW NYLON casting process which permits low cost production of large and complex nylon shapes for tools and dies, gears, bushings, cams and other machinery components is being used by the Polymer Corp., Reading, Pa.

The new process, monomer casting, is the direct conversion of nylon from basic chemical raw materials to finished parts or shapes. The largest parts produced from the material to date have been semi-finished symmetrical shapes in the 500 to 700 lb range. A steel casting the same size would weigh over two tons.

Now commercially available in stock shapes such as tubular bar in lengths up to 4 ft and in plate up to 4 in. thick, the material can be used to make castings for metalworking equipment, papermaking machinery, construction and material handling equipment.



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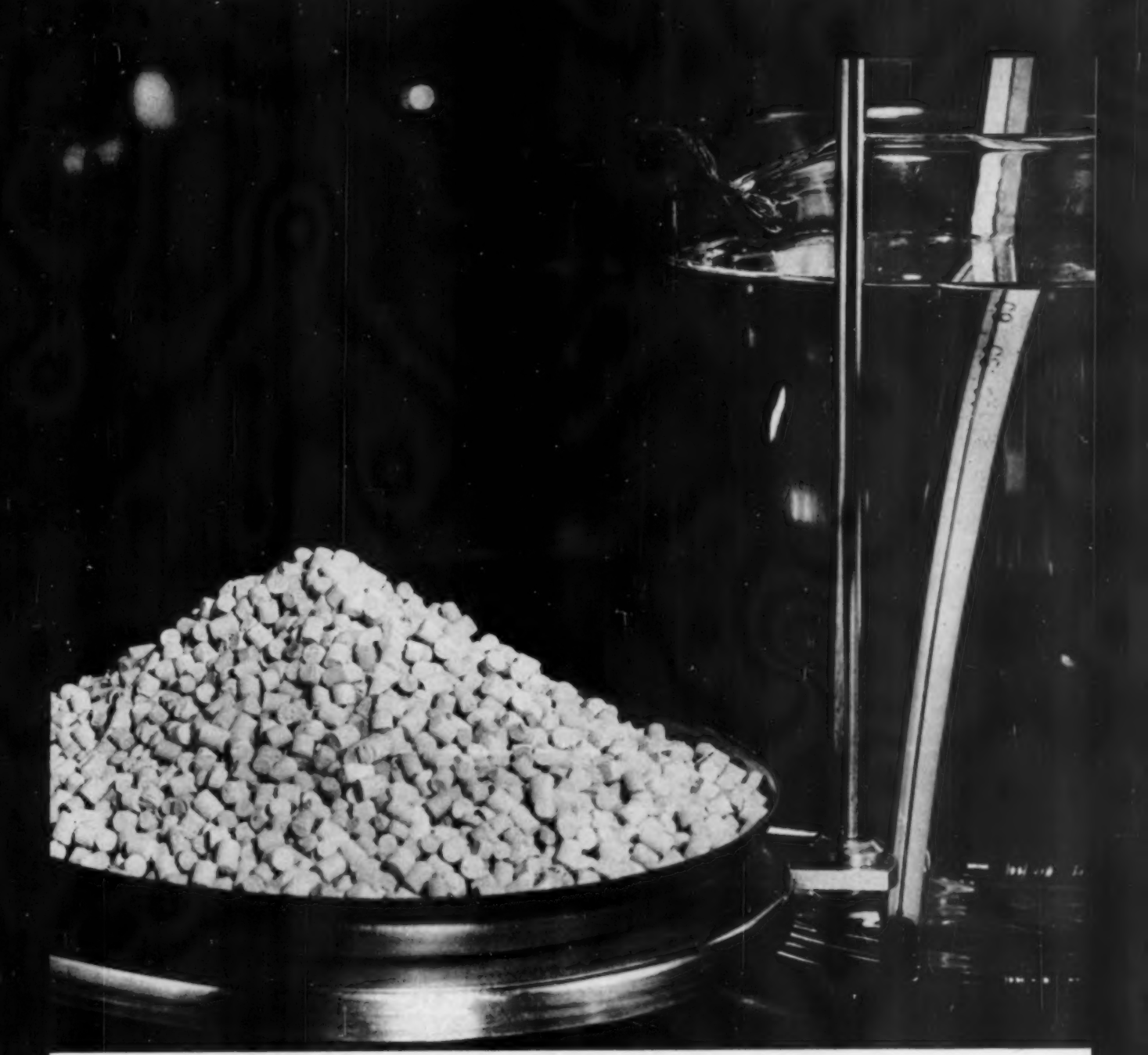

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GULF

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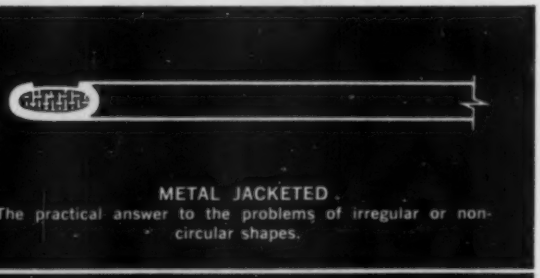

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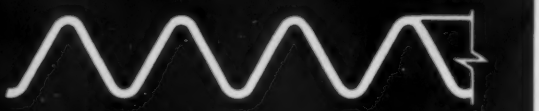

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Johns-Manville produces a broad range of efficient sealing elements based on the six cross-section designs you see above. To guide you in making the best and most economical gasket selection for your particular application and service condition, J-M has now condensed the information you need, in easy-to-use form, into a new 32-page book.

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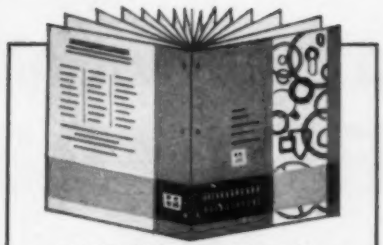

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JM PRODUCTS

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THIS FREE BOOK COULD HELP PREVENT AN ACCIDENT WHERE YOU WORK

You owe it to yourself, and the men you supervise, to learn all about the safety, comfort, and economy of USS Multigrip Safety Floor Plate. This free booklet illustrates the many applications for Multigrip—from plant floors to derrick platforms to ship ladders. What you see in these pages may help prevent an accident in *your* future. For a personal copy of the USS Multigrip booklet, fill out the coupon at right.

United States Steel Corporation • Tennessee Coal & Iron Division • Columbia-Geneva Steel Division • United States Steel Export Company

United States Steel
525 William Penn Place
Pittsburgh 30, Pa.

Please send me___copies of your free booklet, "USS Multigrip Floor Plate."

Name_____

Firm_____

Address_____

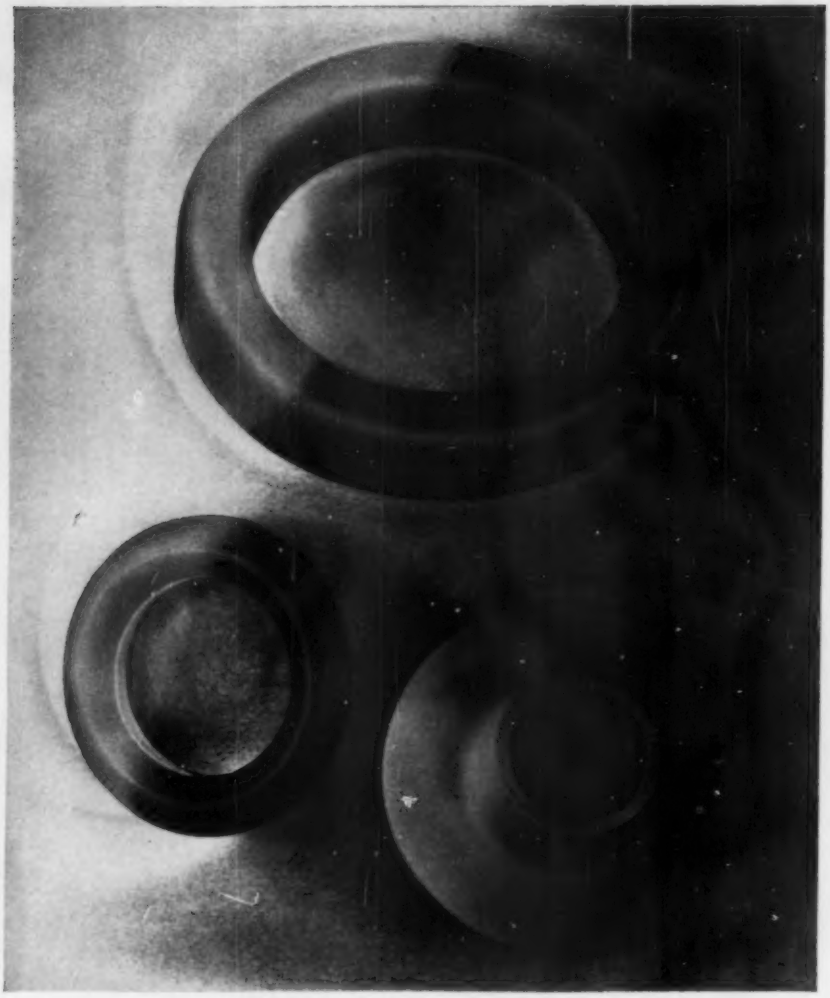
City_____ Zone____ State_____

USS United States Steel

TRADEMARK

Circle 574 on postcard, page 33

MOLY-S_2*, the newest of a variety of impregnations, is available in all shapes of Garlock leather packings . . . molded cups, "U" and "V" packings, washers, gaskets, discs, hat packings.



REMARKABLE NEW MOLY-S_2 IMPREGNATE

. . . adds exceptional anti-friction properties to Garlock leather packings. This new packing lubricant—molybdenum disulfide, a solid material—greatly reduces frictional drag at high pressures (above 1500 p.s.i.), and minimizes wear during break-in periods at low pressures. Heretofore highly effective as a metal lubricant, MOLY-S_2 is now successfully impregnated deeply and evenly throughout the fibers of Garlock leather packings, where it cannot be washed away by operating fluids or forced out under severe pressures. MOLY-S_2 has no melting point, will not separate or break down, is insoluble in water, and contains no graphite or fillers.

Because of its unusual adhering qualities, new MOLY-S_2 impregnate is excellent where fluid or gaseous mediums provide little lubrication to moving parts, or where high pressures limit the amount of vital surface lubricating film. For ideas on how you can apply Garlock leather packings with MOLY-S_2 impregnation, talk to your local Garlock representative. He's at the nearest of the 26 sales offices and warehouses throughout the U. S. and Canada. Or, write for catalog AD-186. Garlock Inc., Palmyra, N. Y.

Canadian Div.: Garlock of Canada Ltd.

Plastics Div.: United States Gasket Company.

Order from a complete line of quality Garlock products . . . Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

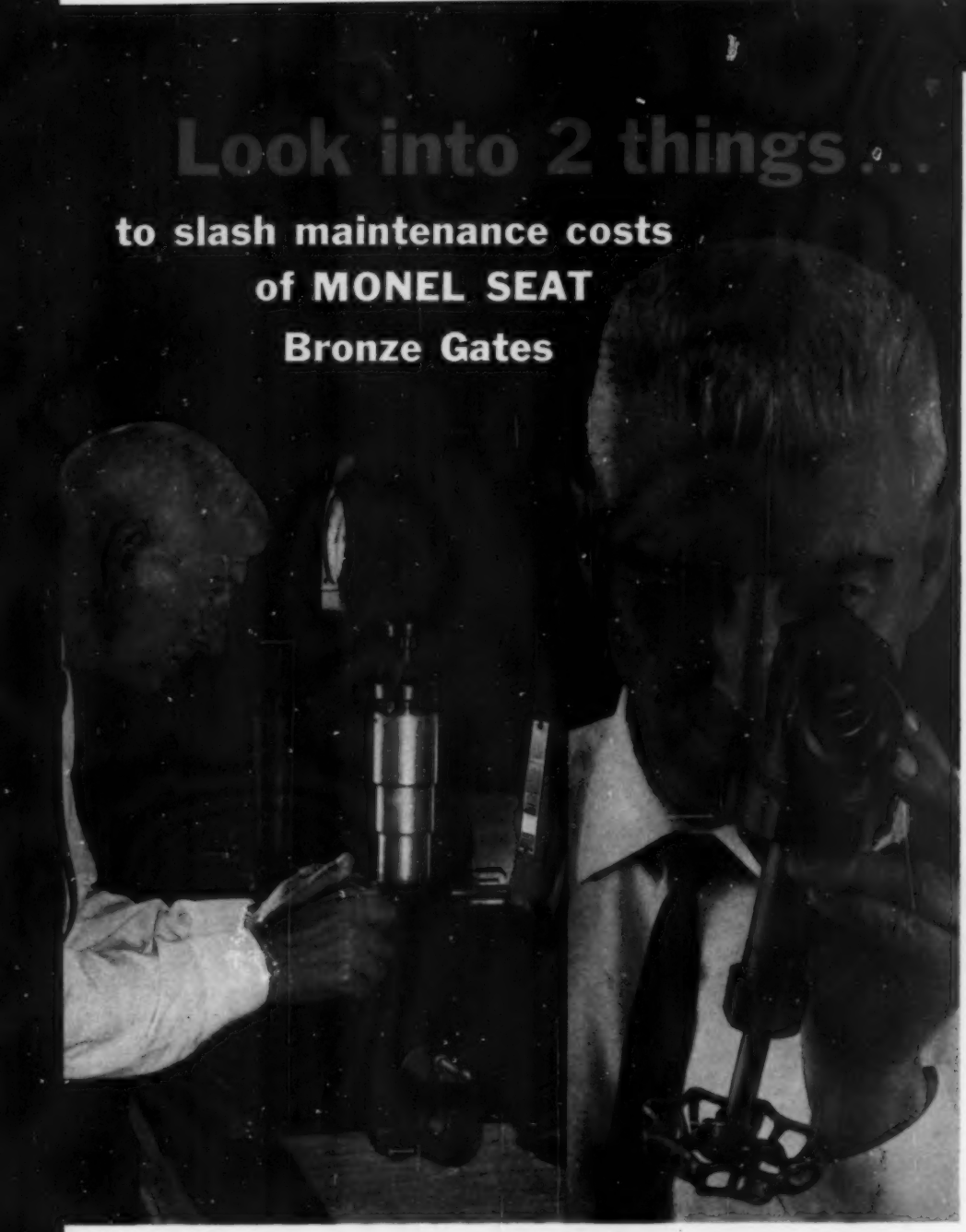
*Garlock Trademark for molybdenum disulfide

GARLOCK

Circle 575 on postcard, page 33

Look into 2 things...

to slash maintenance costs of MONEL SEAT Bronze Gates



What is the RELATIVE HARDNESS of the Wedge and the Seat Rings?

If the bronze or nickel alloy wedge is less hard than the monel seat rings, the wedge will wear. That is GOOD... with the wedge taking the wear, the seat rings will NOT wear, at least, not enough to worry about. So, you avoid the costly, time-consuming task of replacing seat rings or valve body. It's a cinch to replace a worn wedge... merely slip off the old wedge and slip on the new.

How are SEAT RINGS SECURED in the body?

A seat ring leak in a Bronze Gate Valve means big trouble and expense! To avoid it, be sure there is no possibility of seat rings loosening, shifting or deforming. Permanent, all-around support is the only sure protection and to provide it Jenkins expands (flares) seat rings into the body by a special process. This becomes practical when the wedge takes the wear and seat rings last for years and years. There's no need to replace seat rings.

JENKINS HAS THE ANSWERS

— to simpler, lower-cost maintenance. Jenkins gives you a wedge that takes the wear to save the seat rings. Jenkins expands seat rings into the body. These are only 2 of the money-saving features of Jenkins MONEL SEAT Bronze Gates and other types of bronze gate valves stocked by your local Jenkins Distributor.

WRITE FOR FOLDER 181-C which gives complete information about all Jenkins Bronze Gates. Jenkins Bros., 100 Park Avenue, New York 17.

JENKINS VALVES

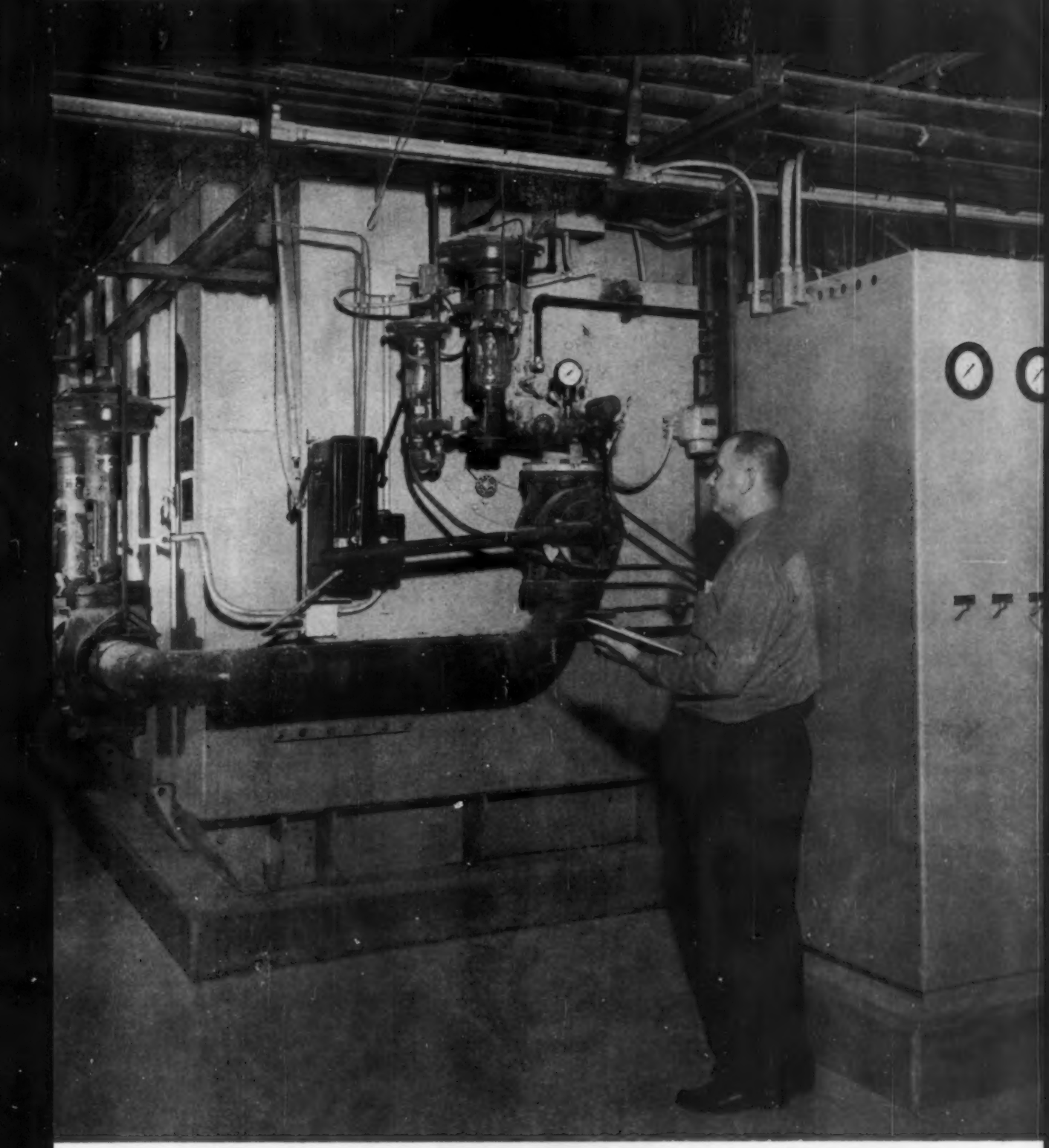
JENKINS SINCE 1864 Jenkins Bros

MOST TRUSTED TRADEMARK IN THE VALVE WORLD

Circle 576 on postcard, page 33

ONE THOUSANDTH "FM" SERIES BOILER
MANUFACTURED BY
THE BABCOCK & WILCOX COMPANY
DEDICATED NOVEMBER 15, 1961
AT CHICAGO, ILLINOIS
THE NEW ST. JOSEPH HOSPITAL
SPONSOR SISTER LOUISE MARIE, D.C. ADMINISTRATOR

Except for this plaque...



it's practically the same as 999 other B&W FM boilers.

The 1000th Babcock & Wilcox FM type boiler is now operating. It generates 20,000 lbs steam per hour at 250 psi and 353 F.

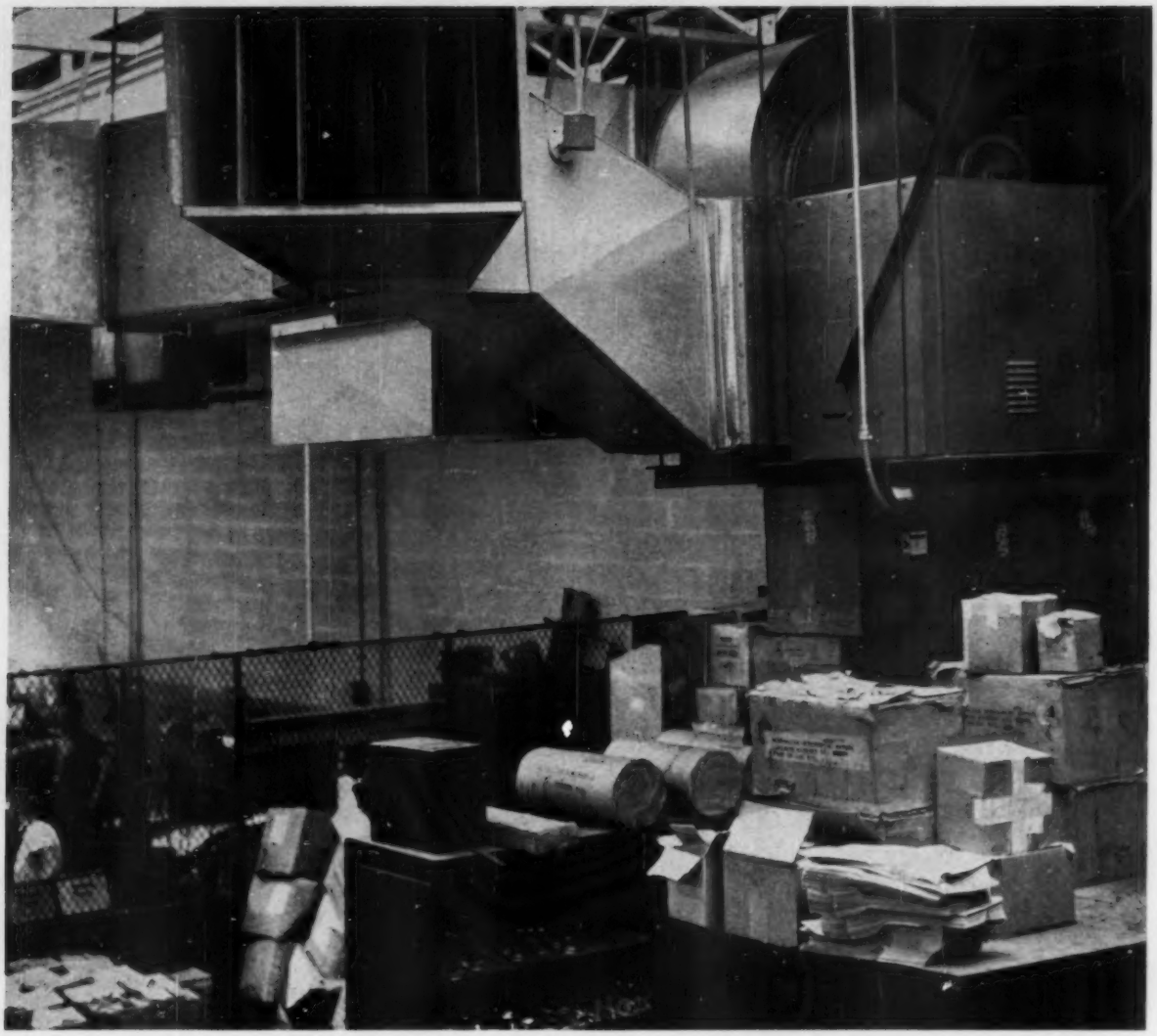
The FM is the most widely accepted and successful package boiler ever developed. In the eleven years since its introduction, the unit has produced heating and process steam economically and dependably in a great variety of installations.

The FM is a shop-assembled Integral Furnace Package Boiler available in capacities of 5,000 to 60,000 lb steam per hour, with pressures to 725 psi and temperatures to 750 F. The FM has automatically controlled oil or gas firing and is simple, safe and easy to operate.

When you need a boiler of assured dependability in the FM size range, contact your nearest B&W sales office or The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

Babcock & Wilcox

Circle 577 on postcard, page 33



This gas-fired make-up air heater, equipped with Maxon burners, replaces exhausted air in the plant of Kiekhaefer Corporation, makers of "Mercury" outboard motors.

Cure plant air starvation with make-up air heated by GAS-fired MAXON burners

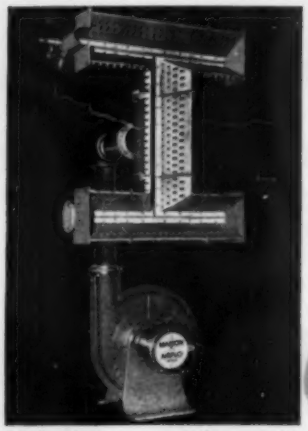
Many plants become starved for air when their exhaust systems remove air faster than it is replaced. This was the problem at Kiekhaefer Corporation of Oshkosh, Wisconsin, before they installed a gas-fired make-up air heater, equipped with Maxon AIRFLO Line Burners.

The entire plant had been under negative pressure, created by suction of exhausters at many grinding operations. This pulled downdrafts in unit heater vent flues. Workers complained of watery eyes and headaches. Condensation dripped on material. Heat loss was excessive. Maintenance cost on unit heaters became prohibitive.

Replacement air, heated by gas-fired Maxon Burners, solved all these problems at minimum cost. In fact, initial cost of this make-up air heater was quickly amortized on reduced maintenance and savings on fuel costs. The plant enjoys all the advantages of modern gas heat: high efficiency, precise control, speed, cleanliness, economy and dependability.

For information on heating make-up air with gas-fired Maxon burners, call your local Gas Company. Or write to Maxon Premix Burner Company, Incorporated, Muncie, Indiana.

American Gas Association



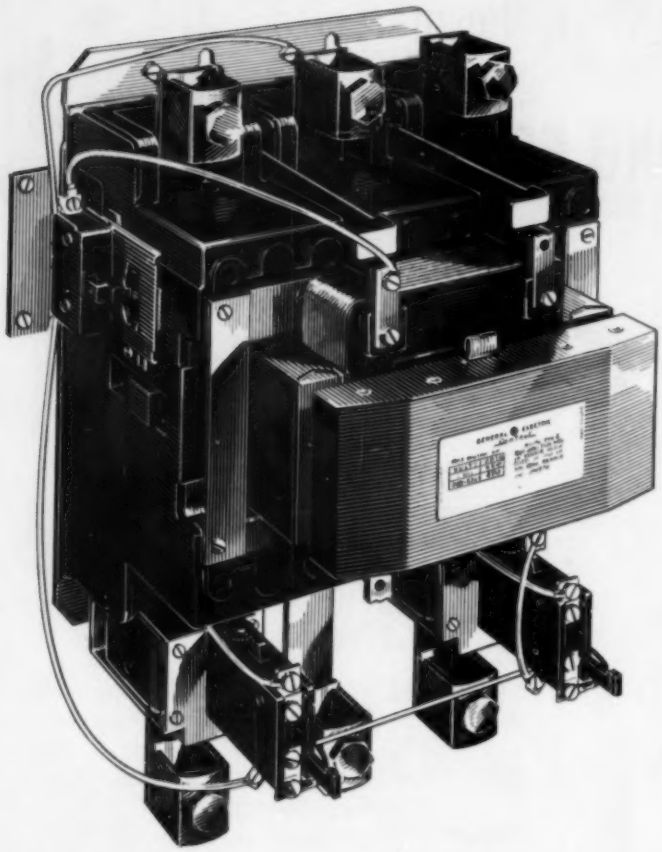
Designed expressly for make-up air heating, the Maxon AIRFLO Line Burner and Mixer provide complete, odor-free combustion over very wide ranges of turn-down. They are standard equipment in many packaged heaters, and are highly recommended for heating the replacement air for paint spray booths in finishing lines.

FOR HEATING MAKE-UP AIR GAS IS GOOD BUSINESS!

Circle 578 on postcard, page 33

THE NEWEST STARTER FROM GENERAL ELECTRIC

. . . and what it means to you



6 DISTINCT ADVANTAGES YOU CAN'T GET ELSEWHERE

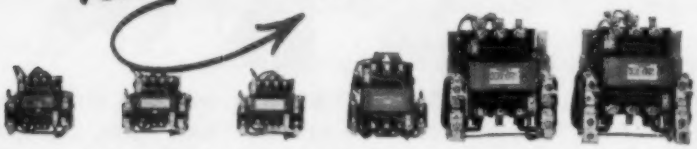
General Electric announces the development of new NEMA Size 5 magnetic starters and contactors—up to 65 percent smaller in open forms than previous designs.

This addition to the G-E 100-Line Starter "family" means you can now get seven sizes that give you six distinct, measurable advantages you cannot get from any other single brand of motor control. They are:

1. **SMALLER SIZE**—particularly in the more popular forms (Sizes 0 and 1). On larger forms, reduced height (as much as 41 percent on Size 5 units alone) saves critical panel space. See dimensions at left below.
2. **EASE OF WIRING**—all terminals are "out front," visible and accessible. Wiring for all sizes is straight through (this can save up to $8 in wire alone for Size 5 installations where line leads come in top and out bottom).
3. **SIMPLIFIED MAINTENANCE AND INSPECTION**—contacts can be inspected or coils changed in less than a minute on all sizes. No tools required on Sizes 00 through 4; only a screwdriver on Size 5.
4. **MORE MODIFICATION KITS**—industry's most complete line lets you modify existing starters on-the-spot in minutes to meet special operating conditions. Result: reduced change-over expense. All starter enclosures have cover knockouts for field-addition of push buttons, selector switches, and indicating lights. Other kits include auxiliary contacts, third overload relay, fuse clips, and coils.
5. **FIELD-PROVED DESIGN**—well over 1,000,000 units are operating in the field today. Exhaustive testing in laboratories and on customer applications since the 1957 introduction is your assurance of 100-Line dependability.
6. **"FAMILY" DESIGN BENEFITS**—G.E.'s 100-Line offers all forms and sizes in the same basic design. You benefit from common installation procedures; common maintenance and inspection techniques; reduced inventory; and such operating conveniences as adjustable overload relays for all sizes. Mounting dimensions for Sizes 00, 0, and 1 are identical; so are dimensions for Sizes 3 and 4. Common mounting dimensions and wiring procedures save time and space during panel layout; also when changes occur in horsepower requirements or industry specifications.

IMPORTANT
SIZE 5 DIMENSIONS REDUCED EVEN FURTHER!

NEW NEMA SIZE 5 STARTERS now added to G-E 100-Line feature extremely small size, plus all 100-Line benefits: Height—14¼"; Width—11½"; Area—163.8 sq in.



NEMA SIZE 00	NEMA SIZE 0	NEMA SIZE 1	NEMA SIZE 2	NEMA SIZE 3	NEMA SIZE 4
H-4 1/2"	H-4 1/2"	H-4 1/2"	H-6 5/8"	H-9 5/16"	H-9 13/16"
W-5 3/32"	W-5 3/32"	W-5 3/32"	W-6 1/4"	W-8 3/4"	W-8 3/4"
A-22.9 sq in.	A-22.9 sq in.	A-22.9 sq in.	A-41.4 sq in.	A-81.4 sq in.	A-85.8 sq in.

Meet all your control requirements—up through 200 hp—with the uniform, field-proved 100-Line, available in all popular forms: Sizes 00, 0, 1, 2, 3, 4, and 5 contactors and starters; plus combination starters; reversing and two-speed controllers. Contact your G-E sales engineer or distributor, or write Section 811-29, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle 579 on postcard, page 33

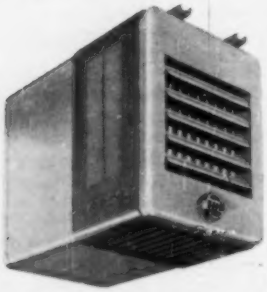
investing in heating?
here's the hottest "stock" on the market...

MODINE UNIT HEATING EQUIPMENT

LIGHTWEIGHT
COMPACT
EASY TO MAINTAIN
EASY TO INSTALL
DURABLE
FUEL-THRIFTY

GAS-FIRED PROPELLER UNITS – Sturdy, attractively styled and exceptionally lightweight . . . up to 50% lighter than other makes of comparable capacities. Direct-fired heat exchangers and clogproof stainless-steel burners hold fuel costs low while assuring just-right comfort. Eight sizes – 25,000 to 310,000 Btu.

STEAM AND HOT WATER UNITS – Three distinct designs: HORIZONTALS can be direct-from-pipe suspended . . . without other supports . . . 24 sizes; VERTICALS are available in 28 sizes. Choice of four air deflectors. Depending upon size selected, mounting height may vary from 10 to 60 feet; POWER-THROWS are specially designed for hard-to-heat locations. High-velocity discharge assures exceptionally long heat-throw . . . up to 140 feet. Available in 10 sizes.



GAS-FIRED BLOWER UNITS – Ideal for heating, ventilating, filtering, cooling. May be installed fully exposed in area to be served or remotely located with duct work. Seven models – 50,000 to 310,000 Btu.

STEAM SPECIALTIES – A complete line: drip, thermostatic and process steam traps; radiator supply and double service valves; strainers; expansion joints; lift fittings.

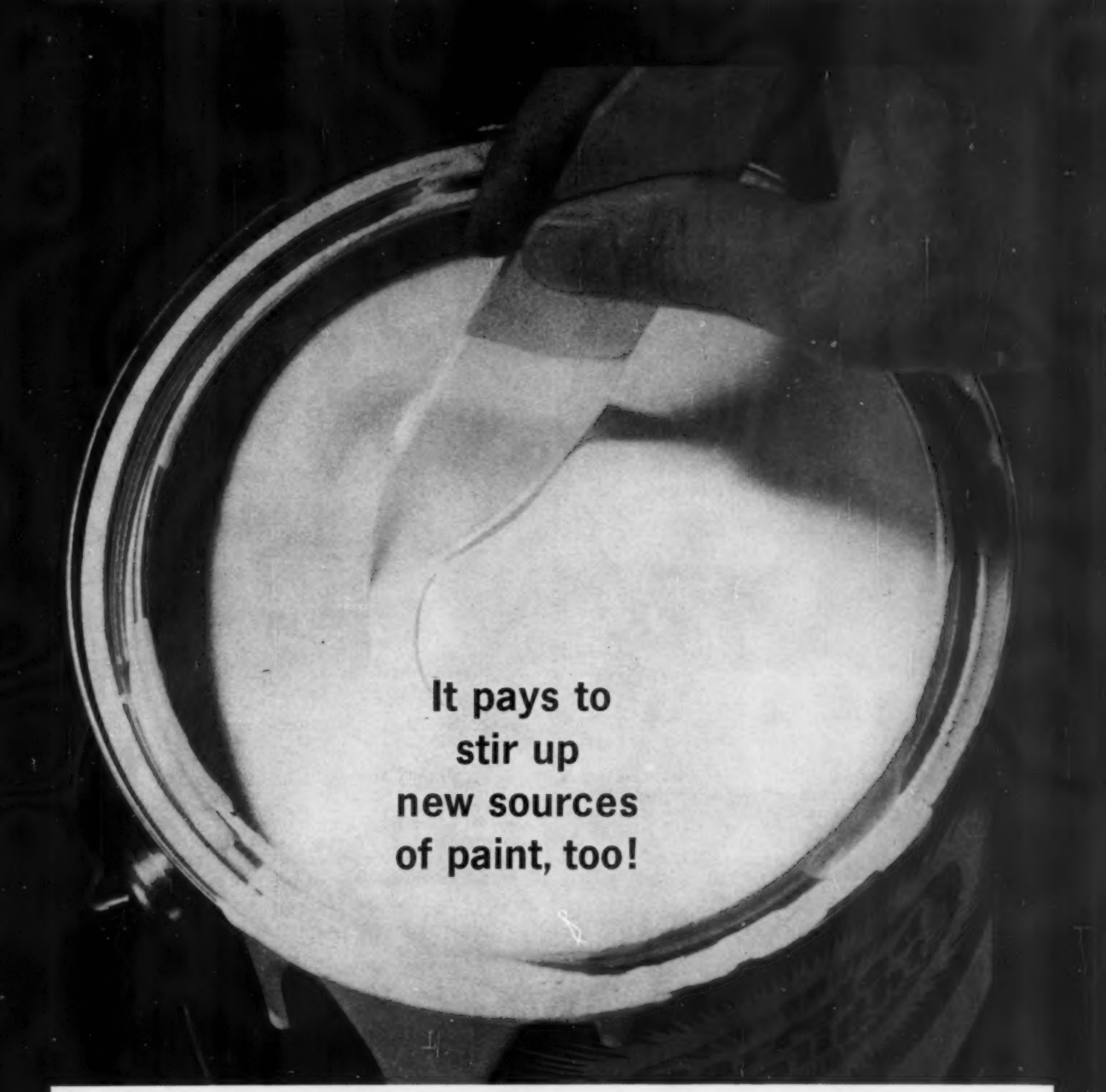
APPLICATION COUNSEL on any of the Modine products shown above may be obtained from your qualified heating contractor. And to fill your requirements, he can draw from the full stocks carried by leading Modine wholesalers in every major industrial area. For product catalogs, write to Modine Manufacturing Company, 1563 DeKoven Ave., Racine, Wisconsin.

Modine
MANUFACTURING COMPANY

IN CANADA: SARCO CANADA, LTD., TORONTO, ONT.

U-1445

Circle 580 on postcard, page 33



(The man from **Barreled Sunlight** has a fresh point of view on paint maintenance.)

It's easy to "get in a rut," when it comes to plant paint purchases. If a certain color or brand looked good once, that's often enough to recommend it a second time around. Even though it may cost more and not look as good as something else! ✓ ✓ A good way to avoid the hazards of "habit buying" is to take a fresh look at your paint maintenance problems through the eyes of a Barreled Sunlight Paint representative. Often he can see ways of improving your color combinations to increase visibility and lower lighting costs. He can take an experienced look at your painting costs, too . . . show you how you may be paying more in application costs than you need to. ✓ ✓ These are a few of many practical paint problems the man from Barreled Sunlight is prepared to discuss with you. Call him in soon for a fresh point of view and a free "On-The-Wall" Demonstration. Write Barreled Sunlight Paint Company, 126L Georgia Avenue, Providence 5, Rhode Island.

SEE US AT MAINTENANCE SHOW BOOTH NO. 811

Circle 581 on postcard, page 33

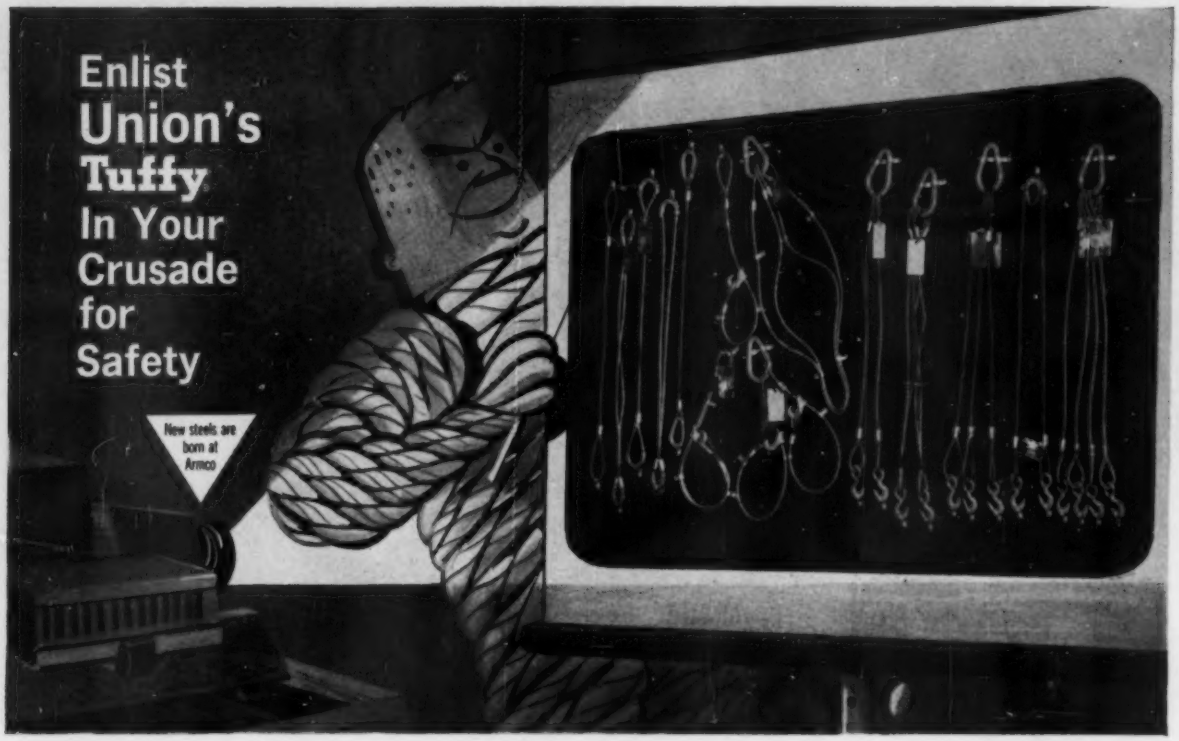
2 FREE GUIDES

The famed Barreled Sunlight **"Quick Reference Guide"** to more than 50 Engineered Paints, Primers and Undercoats plus a 10-page booklet on **"How To Reduce Painting Costs."** Write for them.

Barreled Sunlight

ENGINEERED *Paints*

For a Better Looking, Longer Lasting Paint Job at Lower Cost



"Accidents on the job cost industry more than $4 billion a year," reports the National Safety Council. 230 million man-days were lost, nearly 2 million disabling injuries were suffered in 1959. As rough as these figures look, they represent progress. The accident rate has been cut in half since the twentieth century started.

In plant after plant demonstrations by Union fieldmen have pointed the way to accident reductions. They show how the correct use of the right set-up of Union's Tuffy Slings and Hoist Lines affords greater safety and longer service life.

Proper Fittings Add Safety, Too

Union provides a sling fitting for every need. Fully described in the Tuffy Sling Handbook. Have them factory-fitted when you order slings or rig them yourself. Enroll in Union Tuffy's safety-lift club. Start by sending for the two books offered below.

Union Wire Rope **Tuffy Tips** on safe use of Slings and Hoists

Lifting Strains Take High Toll of Injuries

Did you know that in some states one in every six compensation claims involves back injuries? And that one insurance company says back injuries constitute 60% of their claim expense? Hernia is another hazard of materials handling. One manufacturer reported 75% of his compensation claims involved hernias. This high incidence of hernias and back injuries can be greatly reduced by proper lifting equipment and methods.

Free! Two Valuable Tuffy Handbooks

1. "Tuffy Tips" include many more safety hints. Also tells how to use wire rope and slings to get longer service life. Tuffy Tips do's and don't's can mean money in your pocket.

2. "Tuffy Sling Handbook." Tells all about slings from A to Z. Contains helpful data on the selection and use of slings—types, dimensions, weights, fittings, rated loads, safety-approved signals.

6-61

BOTH FREE! Write Union Wire Rope, Armco Steel Corporation, 2272 Manchester Ave., Kansas City 26, Missouri

ARMCO Union Wire Rope

Circle 582 on postcard, page 33

Circle 583 on postcard, page 33 →

Allen-Bradley's New Bulletin 709 Motor Starters are MUCH SMALLER...

But—there's much more of EVERY OTHER USEFUL FEATURE

Hard to believe—but it's true! The new Allen-Bradley line of Bulletin 709 starters cut mounting space substantially—especially above the Size 1 rating—but all ratings also offer a substantial increase in interrupting capacity, long life, and trouble free operation.

Actually, everything about Bulletin 709 motor starters is new—except the famous A-B simple solenoid principle of operation. The magnet, the contacts, the coil, the overload relays all have been redesigned and vastly improved. There's an entire new line of enclosures, too, into which Brooks Stevens has designed a family likeness and an "eye appeal" that is an added value to all buyers of control, especially where the control is resold.

Let us give you some other important facts about these new starters, which include reversing starters, multi-speed starters, combination starters, etc. Please write for Publication 6100: Allen-Bradley Co., 1316 South Second Street, Milwaukee 4, Wisconsin.

SPACE SAVINGS with New BULLETIN 709 LINE*

Size 00	New
Size 0	24.4%
Size 1	16.9%
Size 2	51.0%
Size 3	40.6%
Size 4	63.9%
Size 5	56.3%

*Compared with old Allen-Bradley starters

25-61-RM

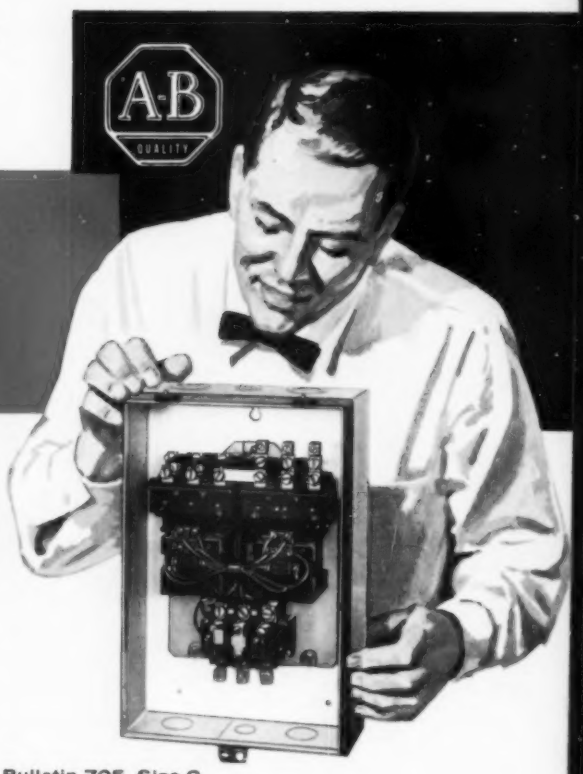
ALLEN-BRADLEY

Member of NEMA

QUALITY MOTOR CONTROL

No "job" can lick this new Allen-Bradley

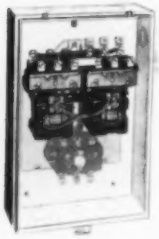
REVERSING SWITCH!



Bulletin 705 Size 2
reversing starter in Nema Type 1 enclosure.
Ratings to 100 hp, 220 v; 200 hp, 440-550 v.

Millions of trouble-free operations! All new A-B reversing switches easily satisfy such specifications. Using the all-new A-B Series K contactors, size has been sharply reduced. Open-type reversing switches match the over-all height of other A-B starters, because the overload relays are mounted on either side of the two contactors. A third relay can be added from the front with a screwdriver.

In the enclosed reversing switch, a two-unit or three-unit block-type overload relay is mounted below the contactors. The mechanical interlocks are new and so simple in design, they just can't fail to give you dependable service. For more details please write to: Allen-Bradley Co., 1316 South Second Street Milwaukee 4, Wisconsin.



MOST ADVANCED CONTACTORS

Though greatly reduced in size, each rating of this new line of reversing switches has a tremendous reverse switching capacity. The new and patented high efficiency magnet is cushioned to reduce shock and wear. The new molded coil is impervious to the most corrosive atmospheres. The new precision hot molded arc hood greatly increases the interrupting capacity and confines the arc. The new weld-resistant cadmium oxide silver contacts seat square—no more sliding motion that causes wear.

NEW, POSITIVE MECHANICAL INTERLOCK

The simplicity and ruggedness of the new cam-type interlocks assure continuous reliability—they're good for the life of the reversing starter. The interlock does not have to be disturbed or adjusted after changing either contacts or coil. It is located between the contactors—out of the way—where careless wiring cannot interfere with the positive and consistent operation of the interlock.

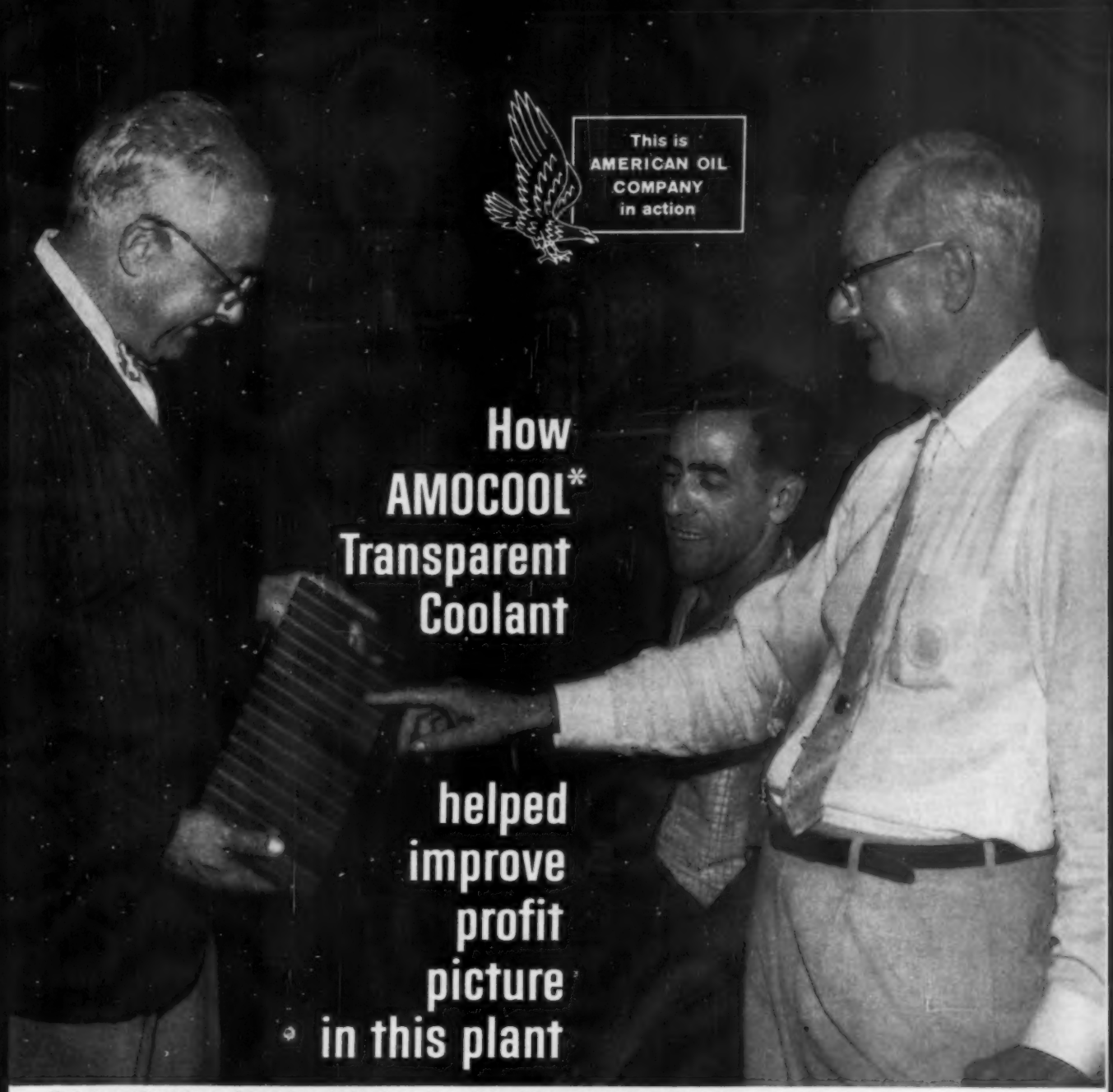
NEW, BLOCK-TYPE OVERLOAD RELAYS

The new A-B trip-free and tamperproof overload relays—either hand or automatic reset—have also been completely redesigned. But the time-proven "solder ratchet" principle, which assures permanent accuracy and reliability regardless of atmospheric conditions—has been retained. The block-type relays are furnished as either two unit or three unit, both having identical mounting dimensions. When used on special control panels, this new design eliminates the need for a separate terminal block. An indicating device is provided on each relay to show when it has been tripped.

25-61-RM

ALLEN-BRADLEY
Member of NEMA

QUALITY MOTOR CONTROL



How AMOCOOL* Transparent Coolant helped improve profit picture in this plant

Eliminate reworking because of rust, reduce wheel loading and extend intervals between wheel dressings; do these and you increase profit per unit, explains Detroit Edge Tool president, Dan Ebbing, to P. E. "Pappy" Stratton of American Oil. Sam Vineh, operator, looks on.

by PAUL E. "PAPPY" STRATTON

About the Author.

"Pappy" Stratton has been providing technical help on lubrication and metalworking problems to customers in the Detroit area for nearly all of the twenty-five years he has been working for the company. In addition to having this store of practical experience to help him, Pappy has completed the Company's Sales Engineering School.

☆ ☆ ☆

By using a soap-base grinding compound, Detroit Edge Tool Company was getting excessive corrosion and rust on work and grinding machines. Oil vapor was collecting on machines and on the ceiling, causing dirty working conditions. Most important, high wheel loading was causing frequent down-time for wheel dressings.

We worked out a test program on AMOCOOL Transparent Coolant with the management. On our first test on one surface grinder, feed pressure was cut substantially while at the same time metal removal was increased.

The cost of reworking parts to remove rust was eliminated. Time required to clean machines to get rid of the odor was cut in half. Less wheel loading and fewer wheel dressings have upped production and reduced costs. Our test program paid out in an improved profit picture. All grinding and drilling equipment has been converted to AMOCOOL Transparent Coolant.

☆ ☆ ☆

Would you like this kind of technical help to assist you in improving profits? Get it by calling the American Oil Company office nearest you.

*Trademark

AMERICAN OIL COMPANY

AMERICAN

910 SOUTH MICHIGAN AVENUE
CHICAGO 80, ILLINOIS

Circle 584 on postcard, page 33

PLANT ENGINEERING EQUIPMENT.

Edited by M. E. Heniken

REMOTE CONTROLLERS for use in air or liquid media

With these temperature controllers pressure on a remote liquid-filled sensing bulb changes with temperature to operate a snap-action switch. One- or two-switch models are available. The former can be used for heating or cooling applications to "make" or "break" on a rise in temperature. Dual-switch models offer sequencing over a temperature differential. As controlled temperature rises, for example, the first switch "makes;" if it continues to rise, the other switch "makes." As the temperature falls, the switches "break" in opposite sequence. Both models can have fixed and adjustable temperature differentials. Units have an external adjustment knob; integral compensating mechanism for case ambient temperatures; single bulb size for all models; removable covers. Three temperature ranges: 0 to 100; 80 to 180, and 160 to 260 F. Single-switch models start at around $33; dual-switch type are slightly higher. Minneapolis-Honeywell Regulator Co.

For details, circle 1 on Post Card

TUBE SYSTEM handles paperwork and supplies

Low in cost and automatic, Econo-Tube is described as a pre-engineered, pre-wired system allowing rapid installation and virtually maintenance-free operation. Carriers can be dispatched from any station to any station. Each walnut-veneer cabinet has a large transparent plastic door, chrome hardware, pushbutton and signal light controls. Flexibility is a feature. A basic system of two or three stations can be installed to handle immediate needs; later, up to 10 can be installed by connecting tubing and wiring. Plastic carriers have a payload capacity up to ½ lb of 8½-by-11 in. paper, can also handle small parts or tools. Because carriers travel in either direction, only a single line of the 2¼-in. ID polyvinyl chloride tubing is required. Econo-Tube is available in 110 or 220 v. Lamson Corp.

For details, circle 2 on Post Card

POLYURETHANE COATINGS in ready-to-apply form

Chemglaze Coatings are one-part, ready-to-use pure polyurethane systems offering high resistance to chemicals, solvents and oils, as well as resistance to dirt, impact and ozone, for surfaces exposed to corrosive materials or hard wear. They are available in hard versions (for concrete, wood, metal, rigid plastics, glass) and flexible versions (for soft plastics, fabrics, leather, paper, rubber), in variety of colors and finishes. Applications include use on process equipment, machinery, conveyor belts, floors, walls, electrical components. Can be applied by brush, dip, roller, or spray. Hughson Chemical Co.

For details, circle 3 on Post Card

SNAP-ON COUPLING speeds fastening flexible tubing

This flat-band snap-on coupling saves time in fastening tubing of canvas, fabrics or plastics to a rigid pipe, tube or duct in heating, cooling and ventilating installations. Coupling is expanded and slipped over the tubing, which is then slipped over rigid tubing and snapped tight with a handle on the coupling. Available for round or oval pipe or ducts from 4 to 36 in. diam. The American Brattice Cloth Corp.

For details, circle 4 on Post Card

More information on any of these products can be yours without cost or obligation. Use reader Service Cards provided on pages 33-34.

COMPOUND removes grime from concrete floors

Highly alkaline powdered material, Oakite 125 is used in water solutions at concentrations from 2 to 8 oz per gallon of water. Cleans with little or no brushing, and is claimed effective in removing skid marks, old grease and dirt from concrete floors and loading ramps. Oakite Products, Inc.

For details, circle 5 on Post Card

STORAGE UNIT comes in quick-and-easy assembly kit

Instant storage units of three- and four-shelf design come in low-cost, ready-to-assemble kits. A total of 120 packaged units are offered, each containing lengths of AIM Brand Slotted Angle, a framing material made with patterned slots and holes for quick alignment, and bolting, accessories, and instructions needed to facilitate assembly. Units are available in 6- to 9-ft heights, 2- to 4-ft depths, 36- to 60-in. lengths, in 6-in. increments. Extra shelf kits are also available. Acme Steel Co.

For details, circle 6 on Post Card

NON-TOXIC CHEMICAL used for sharpening files

Kem-Kut can be used under normal ventilation and safety conditions, and file rinse solutions can be washed into

ONE OF A SERIES OF CHATS ABOUT THE CONSERVATION AND CONTROL OF HEAT

SARCO TOPICS

WHY THE BIG STRAIN?

It's tough to keep gases and liquids "clean" as they run through a pipe. They drag impurities along, which can make even plain water a trouble maker, let alone more sophisticated fluids. That's because water, as a liquid or steam, is intimately involved with vital equipment like steam traps, temperature regulators, or tools. Meters, burners, nozzles, and pumps, too.

By this time you must realize we're going to talk strainers, don't you? A good, stout subject, of interest to all who feel production belongs up and costs belong down. Sarco makes strainers for water and condensate, steam, oil, air, gas and other piped fluids . . . dozens of different sizes and types and ratings of strainers to match every application need. Even our line of plain and simple strainers is built for super service. These are pipeline strainers, types AT, BT, and CT, which are designed for 250, 250 and 600 psi non shock, respectively, and 475°, 450° and 750°F. temperature ratings. Standard screens are heavy-gauge, perforated brass or stainless steel. Sarco specializes in screens that can withstand abnormal pressure differentials created by accumulated sediment.

Next, Sarco's flanged strainers, type D. These come in larger sizes, right up to 12", and are available in standard or extra heavy types.

And finally, *Sarco scraper strainers*, manual or motorized. These are the really eye-popping models, and if you can't use one yourself — well — you'll just have to get your kicks elsewhere.

Examples? Take Inland Steel Company at East Chicago, which gets water from Lake Michigan to cool its large air conditioner condensers. The water used to pass through traveling screens, but still contained fine sand. Clogging!

Heat under collars! Frequent cleaning required! Sometimes practically no air conditioning on hot days. (Isn't that always the way?)

The Inland Steel people installed Sarco Rotary Scraper Strainers, Type VRS, which incorporate a hand-operated helical scraper knife within the cylindrical strainer screen. A few turns of the crank at regular intervals, and the sand is scraped off the screen, blown clear, and discharged at pressure through a manual valve to waste. Dismantle the strainer? Shut down the unit? Not *this* strainer!

Now, as long as we've come this far, it's only a hop and a skip to the Firestone Tire and Rubber Co. in Akron, Ohio, who also use water in tremendous quantities. They circulate it through tire presses and a cooling tower, and there's no nonsense about it. It *has* to be clean or damage to equipment could be downright catastrophic. When the plant

modernized and enlarged, Firestone replaced their 4" Sarco hand-operated scraper strainer, type VRS, with a larger Sarco 8" model. And while they were about it, they got the motor-operated type, for continuous cleaning.

When we say that companies like these want the insurance of a Sarco strainer, it sounds like advertisingese, but sometimes there just isn't any other way to put it. Sarco strainers *are* insurance at low cost on the operation of your high cost equipment. So when we ask if you have lumps in your pumps, or worries over your slurries, we're *serious*. We've heard everything in the straining line, so why not write us for literature and answers to those special problems you have.

A T-44 IS THE BEST POLICY

Sorry, but we can't leave the subject of insurance without bringing to your attention one of the best little insurance policies any company requiring cooling control could invest in. It's the *self-powered* Sarco T-44 Automatic Cooling Control. No compressed air or electricity is needed, but its advantages are best described in terms of three different plants of just one Sarco customer — Revere Copper and Brass, Inc.

Revere-Baltimore, Md., has cut water use 40 to 50% with T-44's. But in addition to former water waste, Revere had even more problems: possible wet air from uncontrolled cooling of compressor aftercoolers, plus sweating compressor cylinders; variations in viscosity of hydraulic oil and bearing oil; gas generator water waste; unreliability of manual shut-off of water supply when machines were down.

If your ears perk up in sympathy at mention of any of these problems, the results of Revere's cooling control program should bring you to full attention. One large compressor that had gulped 2400 gallons per hour now takes only 420 gallon sips. In addition all the problems itemized above were solved. T-44's are now used on their air compressors, gas generators, and hydraulic oil systems. At Revere-Riverside, Cal., water savings of 50% were experienced, and at Revere-Rome, N. Y., substantial savings were made too.

But after all, wasting water is only one way of wasting money, so let's go on to another matter of interest: the evils of manual control. When cooling water is controlled by hand the temptation to leave the valve nearly wide open is almost overpowering, in order to play it safe if the load varies. Result: overcooling, of course. And varying the flow runs the risk of undercooling. In either case, lowered process efficiency. Answer: The automatic Sarco T-44, which can't be tempted, is meticulously honest, unsentimental, and plain inhumanly practical when it comes to cooling control. You really ought to write for literature. T-44 is your best policy.

SPARE PARTS INSURANCE

As long as we're near the end, and still on this subject of insurance, may we graciously leave you with this valuable tip? No matter how closely a steam trap approaches perfection, some gremlin may cause it to act up. It's conceivable. So, keep on hand a parts list and spares of key parts for your steam traps and other system components. Parts are small and worth their weight in gold when you need them. A Sarco field engineer will make up a suggested list for you, if you tell us what components make up your system.

Might as well even keep a disc or two on hand for your Sarco Thermo-Dynamic Steam Traps, Type TD-50, even though they're so trouble-free our salesmen keep complaining about the lack of replacement parts business. We'll be glad to tell you about this unique steam trap in case you still don't know how miraculously simple and effective it is.

Pardon our monopolizing the conversation in this series of paid communiques, but we're trying our best to interest you in certain subjects that concern us both — to the point where you'll communicate.

8903

SARCO

SARCO COMPANY, INC.
635 MADISON AVENUE, NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.
STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • HEATING SPECIALTIES

Circle 585 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

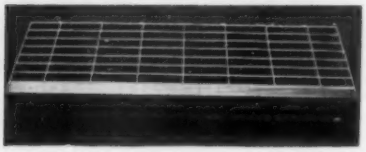
(Begins on page 158)

sewer systems. Sharpening action takes place at room temperature, requiring no external heating. According to manufacturer, chemical will not evaporate or deteriorate, nor is freezing harmful. In sharpening, Kem-Kut etches only 1 to 1½ mils from file surface, allowing teeth to retain designed pitch and rake angles. Chem-Tech Corp.

For details, circle 7 on Post Card

ALUMINUM STAIR TREADS give even load distribution

Indented carrier plate and non-slip corrugated nosing incorporated into design of these stair treads provide



even load distribution and safety. Welding serves only to retain grating position between carrier plates. Offset 5/16 in. and cut 1¼ in. deep, carrier plates are 7/16 by 2¾ in. Treads match manufacturer's rectangular interlocked aluminum grating, come in a wide variety of sizes and bar dimensions. Blaw-Knox Co.

For details, circle 8 on Post Card

FLUORESCENT TUBE is spiral shaped for brightness

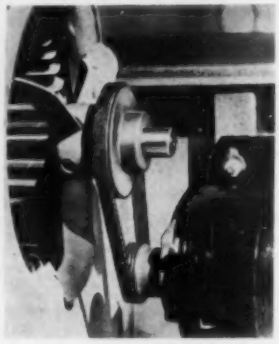
Spiral configuration of Power-Twist produces a powerful arc stream, creating maximum excitation of phosphor inside the fluorescent tube. Cross-sec-

tion of the tube is pear-shaped, designed to provide the highest light output. Manufacturer says it fits existing fluorescent fixtures in commonly used sizes, but can provide even higher light output when new ballasts and fixtures are installed. When viewed in uncovered fixtures, Power-Twist creates a visual effect similar to glare-reducing louvers. Duro-Test Corp.

For details, circle 9 on Post Card

V-BELT DRIVE saves on space and reduces noise

The Poly-V J Belt Drive is designed for use in tight spaces. Increased surface contact with sheave lets belt transmit more horsepower in less space with



lower face pressures. The design also reduces noise and vibration. Installation shown is on an overhead air conditioning unit in which the ⅓-hp motor operates at 1300 rpm. The belt is ⅜ in. wide. Drive sheave is 1.5 in. and the driven sheave is 2.8 in. Manhattan Rubber Div., Raybestos-Manhattan, Inc.

For details, circle 10 on Post Card

EPOXY ADHESIVE features equal part mix by volume

Bondmaster M666 is a two-component system which is mixed in equal parts by volume instead of odd ratios by weight. The "color signalled" formulation has Part A colored red and Part B in clear amber. Mixing the two until striations of color disappear and a uniform tint is achieved is the only preparation needed. The adhesive may be applied with spatula, trowel, roller, knife, brush, or spray, at reportedly ⅓ to ½ the cost of conventional adhesives. Rubber & Asbestos Corp.

For details, circle 11 on Post Card

SLIDING ACOUSTICAL WALL adapts space to needs

Operable Wall is said to provide sound control equal to many fixed walls. Tests are reported to show an overall average of 39 decibel sound reduction, and a 42 decibel reduction in speech privacy range. Sound control properties are due to design in which rockwool-packed steel panels provide a double-wall effect. Continuous sealing at perimeter and panel joints keeps out sound leaks. In place, Operable Wall has a flush, permanent appearance. A floor guide holds panels in place. Work surfaces of chalk and tackboard can be permanently applied. A communicating panel permits access between divided areas. Wall is manually operated; panels slide in or out of place on a hanger assembly. A 30-ft wall can be stacked in an area less than 2-ft deep. Panels are available with baked-on enamel finishes needing no painting. The E. F. Hauserman Co.

For details, circle 12 on Post Card

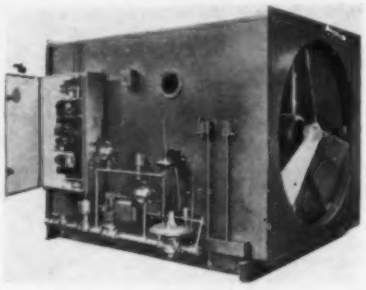
ICE MELTING COMPOUND has added penetrating power

Addition of Xylo-Phosite to X-73 Ice Remover, for use on pavements, gutters, downspouts etc., is said to have increased its melting effectiveness and rust inhibitive qualities. X-73 is claimed the most practical and economical method of ice and snow removal, harmless to concrete, shrubs and grass, leaving no residue to be tracked inside. The Monroe Co., Inc.

For details, circle 13 on Post Card

MAKE-UP AIR UNITS are self-contained, gas fired

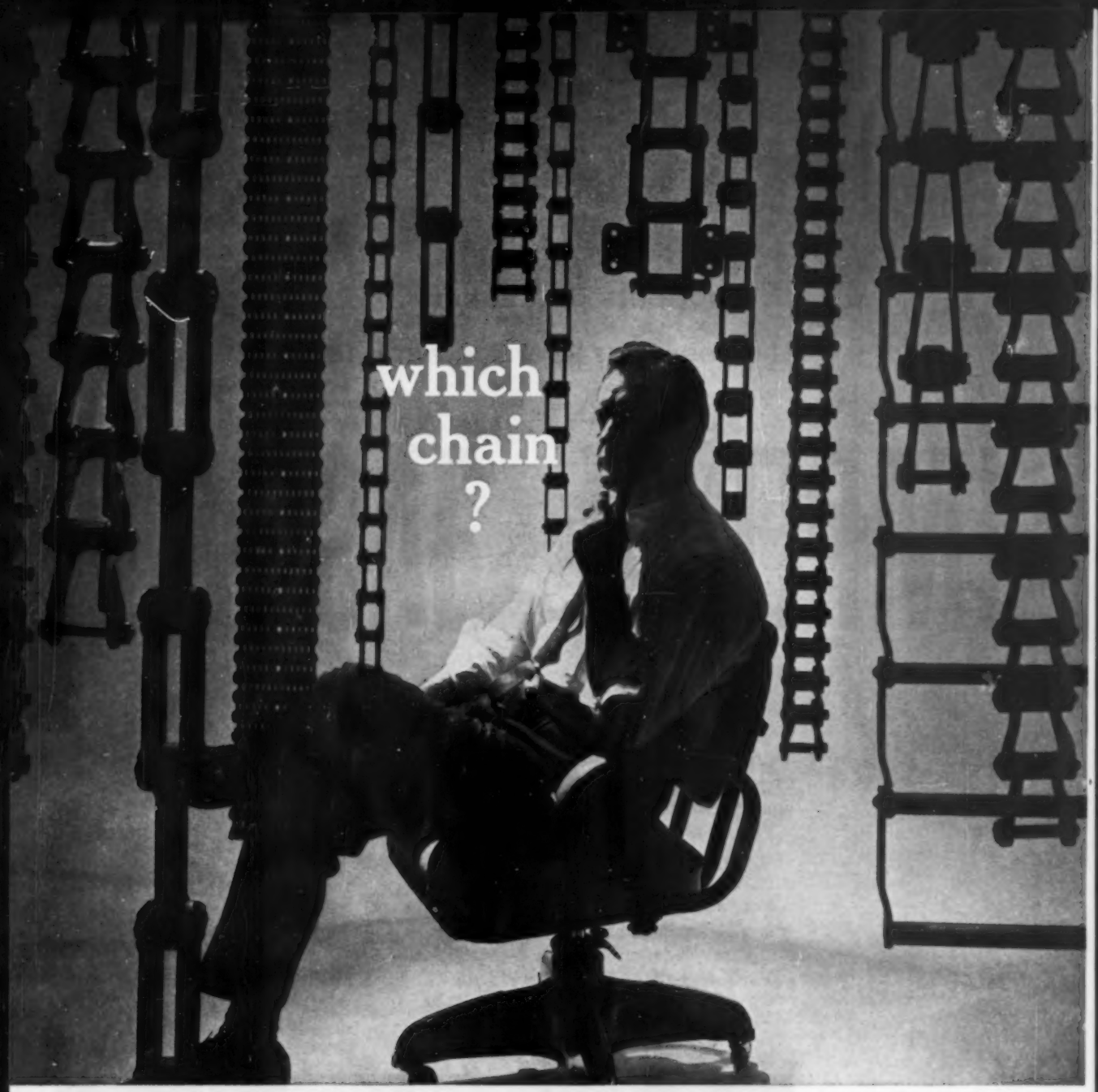
Type MG Units come in three basic sizes, providing six ratings. Air deliveries range from 22,000 to 70,000 cfm; Btu ratings from 2,125,000 to 5,375,000, with all units incorporating



a burner designed to deliver all available heat in the gas into the airstream. Modulating controls provide a 25:1 turn-down ratio, to permit effective performance under all outdoor temperatures. Summer-winter controls enable use for hot weather breeze cooling. The combustion system is combined with an airfoil propeller fan into a compact unit-housed assembly with an overall length of only 8 ft. Propellair Div., Robbins & Myers, Inc.

For details, circle 14 on Post Card

(More Equipment on page 163)



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OFFERING YOU HUNDREDS OF STANDARD CHAINS—Link-Belt can help you choose the one chain that's precisely *right* for your power transmission or conveying application. Each chain is as individual as a thumbprint, with characteristics mated to specific job needs. And Link-Belt experience is at your service—to help you evaluate particular performance factors . . . to save you time in choosing the one best chain for your application (in terms of high efficiency, low *total* cost). Contact your nearby Link-Belt district office or authorized stock-carrying distributor. Ask for catalog 1050 covering the complete line of Link-Belt products and components for materials handling and power transmission.

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LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World. 15.714

Circle 586 on postcard, page 33

All here . . .

components that satisfy

all pressure/flow system needs

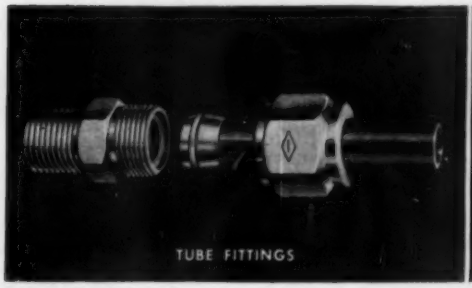
IMPERIAL EASTMAN

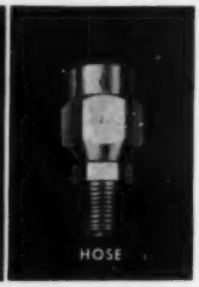
Now together, Imperial-Eastman meets all your hydraulic-pneumatic-flow component needs: tube fittings, valves, couplings, flexible and rigid hydraulic lines, thermoplastic tubing and tubing tools.

This *engineered* line gives you the exact product for every type of service condition—and the tools to make sure your assemblies are absolutely right.

For added satisfaction at your point of order, Imperial-Eastman products are available through highest caliber distributors.

For complete information, write for Catalog No. 101.





IMPERIAL EASTMAN

Imperial-Eastman Corporation General Offices: 6300 West Howard Street, Chicago 48, Illinois

In Canada: Imperial-Eastman Corporation (Canada) Ltd., Toronto

Circle 587 on postcard, page 33

Only

IMPERIAL EASTMAN

offers a line as complete as this

When we say *your most complete line* of pressure flow system components for all hydraulic, pneumatic, instrumentation and other applications—here's what we mean:

TUBE FITTINGS OF EVERY TYPE AND SIZE—FOR ALL PRESSURES, TEMPERATURES

- Hi-Seal® Butt Joint Fittings, Braze-Seal Hi-Pressure, Hi-Duty, 37° Flare, 45° Flare, Flareless, Flex, Compression, Inverted Flare, Threaded Sleeve and Plastic Tubing Fittings.

FLUID CONTROL VALVES

- Needle, Toggle, Diaphragm, Plug, Blow-Down and Kwik-Connect Types for pressures up to 5000 psi.

HOSE AND COUPLINGS

- Medium-Pressure Hose and Tube Assemblies, Couplings and Fittings for One-Wire Braid Hose
- High-Pressure Hose and Tube Assemblies, Couplings and Fittings for Multiple-Wire Braid Hose
- Low-Pressure Hose and Tube Assemblies, Couplings and Fittings for Fabric Braid Hose
- All Synthetic—for Pressures up to 3000 Lb.
- Adapter Unions, Adapters and Tube Fittings

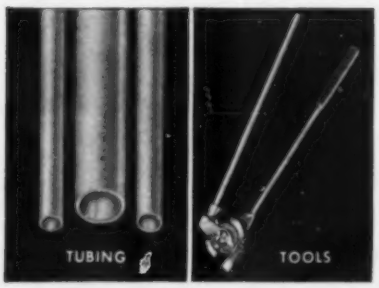
TUBING

- Plastic and Thermoplastic

TUBING TOOLS

- Cutting, Flaring, Bending, Reaming, Swaging, Pinch-off, Refacing Tools
- Service Aids

No doubt about it now—see your Imperial-Eastman distributor *first* for all hydraulic-pneumatic-flow system components.



IMPERIAL EASTMAN

Chicago 48, Illinois

PLANT ENGINEERING EQUIPMENT

(Begins on page 158)

WALL CABINETS for audio and electronic equipment

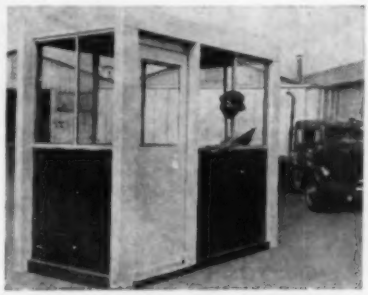
These steel cabinets feature rugged construction and a vertical piano hinge that supports several hundred pounds

of equipment, yet lets it swing out easily. Cabinets come in a variety of sizes in a fully recessed type (shown), in semi-recessed models, and in models for installations where equipment must hang on the wall with no recess. Steelcraft, Inc.

For details, circle 15 on Post Card

GATEHOUSE affords visibility, protects occupant

Available in three sizes and in many weather-proof porcelain enameled colors, this multi-purpose gate house is adaptable to most climates and terrains. Fully assembled, it sells for around $1000 to $1250. The house features a laminated wall system with porcelain enameled steel panels bonded to plywood. The panel core is ⅞-in. foamed polyurethane, and the inside finish is vinyl laminated to steel, also bonded to plywood. The roof is the same integral unit as the walls; the floor is asphalt tile bonded to plywood. The complete unit is built around a framework of 2½-by-6 in. structural wood bents covered with porcelain enameled steel. All sizes—4-by-4, 4-by-6, and 4-by-8 ft—have sliding aluminum windows on all sides. The smallest has a swinging door, the others have sliding doors. Electrical wiring, interior lighting and electrical plug-in strip are included. The Erie Enameling Co.



For details, circle 16 on Post Card

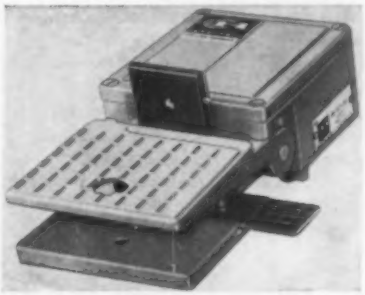
LUBRICATING PASTES withstand higher temperatures

Luball, with molybdenum disulfide, and Compound No. 2 are packing lubricants for improving performance of packings. They resist water, steam and chemicals to 500 F, and available in a variety of weights. Bulletin AD-189 gives particulars. Garlock Inc.

For details, circle 17 on Post Card

FOOT SWITCH, treadle-operated, heavy-duty type

Type B Foot Switch is available with one or two unit switches, each with one normally open-one normally closed contact arrangement. An adjustable lever assembly permits simultaneous tripping



of unit switches, or differential tripping for second stage operation. Light, medium, or heavy duty second stage feel springs permit operator to feel differential between first and second stage switch actuation. (Springs can be converted from light to medium to heavy in the field.) A treadle latch allows conversion from spring return to maintained contact. Unit comes with NEMA 4 watertight and oiltight enclosures; is available with NEMA 7 and 9 enclosures for hazardous locations. Cutler-Hammer, Inc.

For details, circle 18 on Post Card

"BOILER WITH BRAIN" shows cause of any shutdown

As announced by manufacturer, Model R-175 automatically indicates cause of safety shutdown due to ignition failure, or shortages of water, fuel, electricity or combustion air. It delivers 5000 to 6000 pph steam at high and low pressures, up to 72,000 pph steam or higher

PLANT ENGINEERING EQUIPMENT

(Begins on page 158)

in multiple installations. A safety lockout annunciator system operates by means of a group of indicator lamps on boiler control panel. In case of water shortage, overfiring, excessive temperatures, fuel failure, too-high or too-low oil level, damper failures, or any other factor leading to failure or malfunction, the proper lamp lights to point out cause of burner shutdown. Clayton Mfg. Co.

For details, circle 19 on Post Card

UTILITY CHAIN WRENCH available in new size

The C-12 accommodates ⅛- to 4-in. pipe, and features ratchet-like action in either direction without having to remove and refasten it. Only ¾-in. clearance is needed to apply it. The 12⅞-in. handle, of alloy steel forging, and jaws are nickel-chrome plated. Chain length is 15¾-in.; extra links may be added. Total weight of wrench is 1 lb, 12 oz. The Ridge Tool Co.

For details, circle 20 on Post Card

EXIT SIGN uses little current, has greater visibility

This exit sign with Rayescent panel is claimed to have 33 per cent more visibility than incandescent signs under smoky conditions. Treated with red dyes for a red glow, this sign can be flush mounted or suspended from ceiling. The electroluminescent panel is metal with a phosphor layer that transmits light through a transparent conductive surface coating. It produces little heat, requires only negligible current. It operates on 120v a-c,

incorporates a transformer for changing it to 240v. The panel is said to draw 1 w the first few hundred hours, then may drop as low as 0.65 w. Half life of 15,000 hr is reported. Available in 6-by-12-in. size with 5-in. letters. Westinghouse Electric Corp.

For details, circle 21 on Post Card

ROOF COATING can be applied during a rain

Wet-Jet uses a water repelling additive which makes it stick to wet roofs. It contains gilsonite asphalt which has been siliconized, is ready to apply without heating, and can be used in sub-freezing temperatures. For patch work and complete renewals of all types of roof but shingle, coverage is 1½ gal to each 100 sq ft on metal, smooth composition, felt or paper roofs —about 2 gal on concrete or slate surfaced roofs, and 3 to 5 gal on gravel roofs. Pace Products, Inc.

For details, circle 22 on Post Card

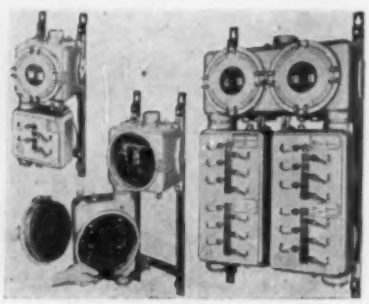
BUILDING PANELS provide greater visual efficiency

Shatterproof-weatherproof Polrized Structoglas is glass fiber reinforced, acrylic-modified polyester and is designed for use where vision is important. It polarizes light, reducing both direct and reflected glare. According to manufacturer, building panels of this material give 46 per cent more visual efficiency, and greatly increase effectiveness of daylighting produced by the large wall openings. Structoglas, Inc.

For details, circle 23 on Post Card

EXPLOSION - PROOF PANELBOARD for hazardous locations

EDP Series Panelboards may also be used in non-hazardous locations where corrosive vapors, non-combustible dusts or moisture are present. Use of a "pivot" between junction and breaker housing is the key to compact size, plug-in "E" frame breakers, easier installation, quicker main and branch



wiring and simplified maintenance. Panelboards are engineered to handle motor control, machinery, alarm lighting and wide range of circuits requiring breaker capacities of 15, 20 or 30 amp. They are available for four to 24 single pole, two to 12 double pole and one to eight three-pole circuits. Appleton Electric Co.

For details, circle 24 on Post Card

DOCK BUMPERS offer protection, mounting versatility

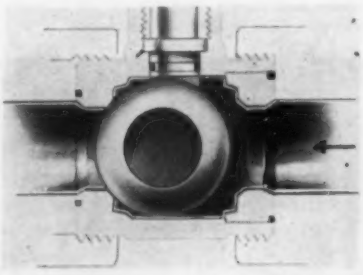
According to manufacturer, Protector Bumpers can't sag because they're built around a heavy 3-in. structural reinforcing bar. Cushioning action is achieved by tough rubber and fabric

sections taken from the tread and laminated under pressure. In addition to conventional mountings, these bumpers can be placed in vertical or "interlace" positions. The former provides dock and truck protection below normal dock heights. Full length dock protection is provided by the structural angle mounting system which permits units to be "interlaced." The bumpers come in 12-, 24- and 36-in. lengths, all 4 in. thick. Bulletin LS-404 gives information. The Kelley Co.

For details, circle 25 on Post Card

BALL VALVE incorporates fire-safe properties

Petro Ball Valve is now available with Teflon seat in addition to Nylon, buna-N and Neoprene seat, for flow control



of combustible materials in petroleum, gas, petrochemical, chemical and other piping systems. Under fire conditions, the Teflon seat sublimes, permitting the ball to shift against the chamfer (as shown) and form a metal-to-metal seal that withstands maximum pressure of 1000 psi. Effective operational range is –450 to 450 F. Valve comes in

Airless Spray—Painting's Newest Cost Cutter

That painter up on the scaffold is using a new, highly efficient *airless* spray outfit. With it, he's laying on a full "wet" coat of paint; getting ample film build with one pass, without spray fog; and he's working comfortably at a speed that's 5 times faster than contact application methods. We call this outfit: The DeVilbiss 5-gallon portable airless. You'll call it the most important improvement in painting convenience in decades. It's tailor-made for the hundreds of one-man paint jobs in and around large structures like this hangar—or like your plant. It's compact and simple. A 5-gallon tank, built-in pump, regulator, hose, airless spray gun—that's it. One man can easily tote its 17 pounds anywhere. Write for folder I-3504 or, better yet, check the Yellow Pages for our nearest representative. The DeVilbiss Company, Toledo 1, Ohio. Also Barrie, Ontario; São Paulo, Brazil; and London, England. Offices in principal cities.

FOR TOTAL SERVICE, CALL
DE VILBISS

Circle 588 on postcard, page 33

TO
CURE
INDUSTRIAL
CORROSION
PROBLEMS
INSIDE AND
OUT

IT'S GOOD TO KNOW **CARLON** PLASTIC PIPE

Carlon's new Plastic Pipe Fact-pak can save your company money. Includes chemical resistance tables, operating temperatures and pressures. *Write for yours.*

KNOW THE FIRST NAME IN PLASTIC PIPE
CARLON

CARLON PRODUCTS CORPORATION
Box 133 — Aurora, Ohio — Dept. PE-6

Please send me the new Plastic Pipe Fact-pak.

NAME_____
TITLE_____
COMPANY_____
ADDRESS_____
CITY_____ STATE_____

Circle 589 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

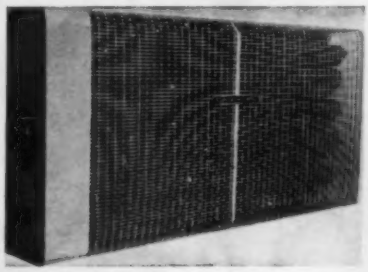
(Begins on page 158)

forged stainless steel, carbon steel or brass in sizes from ¼ through 2 in. Clayton Mark & Co.

For details, circle 26 on Post Card

EXPLOSION-PROOF HEATER for hazardous areas

This explosion-proof electric comfort air heater is designed to automatically provide desired warmth with safety where gasolines, solvents, gases, fumes

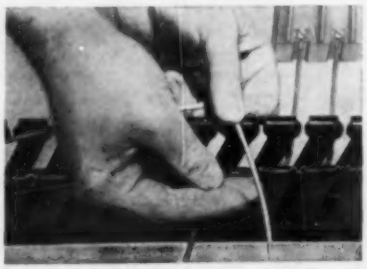


and other flammables are present. An elongated heavy-duty Chromalox metal-sheathed brazed-fin heating element is the heat source. It has a low watt density and is embedded in compacted refractory. The heater has steel framework, housing and parts. A baffle directs heat flow outward. The unit—UL approved for Class 1, Group D use—is installed by hanging on a wall-flange mounting, and making the necessary electrical connections. Edwin L. Wiegand Co.

For details, circle 27 on Post Card

WIRING RACEWAY permits faster work, easier revisions

Panel Chanel Style Series VN lets wires be inserted through the top of the channel wall, but prevents them from springing out of position before



connections are made. It has wire slots with contoured top openings shaped to hold the wire in position after insertion. Surfaces are rounded to prevent insulation damage. Top ac-

Compact Packaged Air Preheater being unloaded for installation on new 100,000 lb/hr boiler at Hoffmann-La Roche's Nutley, N. J. headquarters. In operation, it will increase the temperature of the combustion air 375°F—thereby increasing boiler efficiency by approximately 8%.

PACKAGED AIR PREHEATER

WILL RECOVER 330°F FROM NEW BOILER FOR HOFFMANN-LA ROCHE INCORPORATED

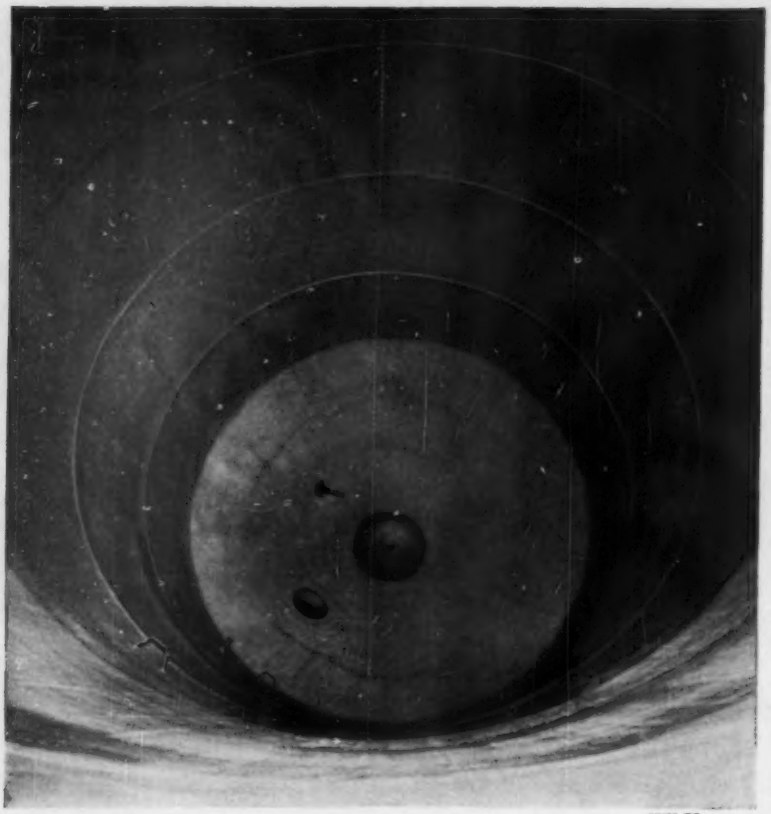
Hoffmann-La Roche, one of the leading producers of pharmaceuticals, vitamins and aromatic chemicals, specified a Ljungstrom Packaged Air Preheater for their new boiler for three reasons: 1) This compact, preassembled unit is ready to run as soon as it's connected to the power line and ducts—no extra installation or erection costs; 2) The unit occupies only about 450 cubic feet of space but will cut boiler exhaust temperatures from 680°F to 330°F—for about 8% saving in fuel; 3) Savings in fuel alone—roughly 1% for every 40°F drop in exit gas temperature—can pay for the unit in two short years!

Packaged Ljungstroms are available in sizes for use on boilers in the 25,000 to 250,000 lb/hr range—can give you these same fuel saving advantages. For full information, write today for our 14-page Packaged Air Preheater booklet.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

Circle 590 on postcard, page 33



10428-CC

CEILCOTE CORROSION-PROOF COROLINE 505 TANK LININGS

COROLINE 505 LININGS . . . reinforced with Type "F" glass cloth are used for handling hot detergents. Other applications include: Chemical Storage tanks, processing tanks, pickling and plating tanks, pits and foundations. Tough, durable and long-lasting, COROLINE 505 provides proven resistance to most acids, alkalis and solvents . . . and, features good temperature resistance without permitting age hardening.

EASY APPLICATION IN SHOP OR FIELD: Applied in a "build-up" process, COROLINE 505 works easily with either trowel or brush. For steel or concrete surfaces, COROLINE 505 is generally reinforced with glass cloth. Application thicknesses vary from 1/32" to 3/16" depending on required operating conditions.

Send today for the CEILCOTE COROLINE BULLETIN . . . it contains all the facts.

CEILCOTE COMBINES MINDS, METHODS AND MATERIALS . . . . . for the design and construction of CORROSION-PROOF equipment and installations for all industries.

CEILCOTE

THE CEILCOTE COMPANY, INC. • 4915 Ridge Road • CLEVELAND, OHIO

Circle 591 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 158)

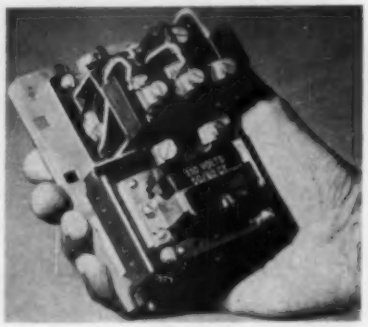
cess to wire slots also makes it easier to handle wires with connectors attached. Available in black, gray or white in a full range of sizes, the raceway is molded of a flame-retardant non-warping thermosetting plastic. Bulletin S-305 describes it. Stahling Brothers, Inc.

For details, circle 28 on Post Card

Use the Reader Service Cards provided on pages 33-34 to ask for more information on this equipment. Circle item numbers of the products in which you are interested.

LATCH RELAYS for machine tool, other control uses

Type HRLR A-C Multi-Pole Relays are used where control circuits must function independently of circuit or power failure, as well as where noise caused by normal a-c hum or vibration



is intolerable. Compactly designed latch assembly mounts in place of two center unit poles. Relays feature continuous duty coils on main relay and latch assembly; unitized convertible poles; high electrical reliability and long operating life. Available with two, three, four or six normally open or normally closed unit poles, relays come with standard coils to 220 v, 60 cycle a-c-. Bulletin 4470 gives data. Ward Leonard Electric Co.

For details, circle 29 on Post Card

COOLING WATER BIOCIDE is wood preservative

Ionac Biocide 1825 controls growth of algae and bacteria and also protects wooden portions of cooling water systems. The formulation is a water solu-

HOW TO DO IT BETTER MAGNETICALLY

Compact Magnetic Sweepers

Pick Up Dangerous Metals Easily, Economically
Clear accident-causing tramp iron, chips and shavings from factory aisles, floors, docks, runways and roadways with the Dings non-electric magnetic sweeper best suited for your needs.

Dings Road Sweepers, either trailer-mounted or suspended from any mobile equipment, are lightweight; magnetism is guaranteed permanent. Dings Compact, Non-Electric Floor Sweepers, are newly designed for quick, easy cleaning.

Write for Sweeper Bulletin

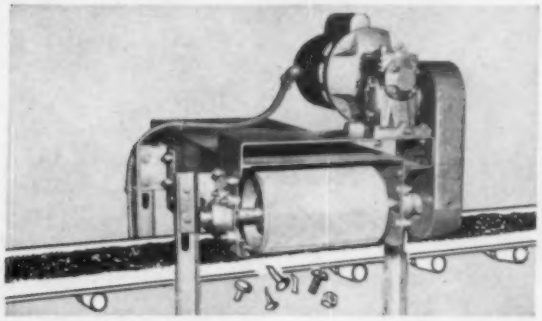
Magnetic Detector

DINGS Low-cost Universal Series Metal Detectors . . .

. . . signal the presence of all magnetic metals which pass thru the Detector Search Coil. Low power consumption. Simple in design. Requires no attention. Place the search coil around the belt . . . plug into any single phase outlet and turn on the switch—for *automatic* tramp iron protection.

Write for Bulletin 1901-B.

Self-Cleaning Magnetic Separator



No Iron Accumulation. No Manual Attention.

Dings Self-Cleaning Perma-Plate is designed to stop costly tramp iron damage, metallic contamination and eliminate clean-off slowdowns.

It can be suspended over flat or trough type conveyors, chutes or spouts. Magnetic attraction holds iron to the moving crossbelt until it is carried beyond the magnetic zone. Here it can be deflected to container or chute. *Write for Catalog 1206-B.*

Tramp Iron Rogues Gallery

BUTCH BOLT
8943072
Wanted for sabotage. Last seen in delivery of raw material to Apex Powder Company. Is presumed lost in blast attributed to tramp iron spark.

STOP TRAMP IRON DAMAGE BEFORE IT COSTS YOU MONEY!

PE-461

DINGS MAGNETIC SEPARATOR CO.
4760 West Electric Avenue
Milwaukee 46, Wisconsin

LET Dings DO IT

Circle 592 on postcard, page 33

TERRIFIC MAINTENANCE TIME-SAVER!

Porter-Cable Porta-Band Saw

Cuts all metals—even grades of stainless and tool steels—fast, smoothly, clean, and in hard-to-get-at places. Cuts plastics, too, and problem materials. Zips through pipe, cable, castings, housings, metal lath, rods, bars . . . you name it, this Band Saw will cut it! And fast!

Well balanced, easy-to-use. Rugged 6.5 amp. universal motor, blade speed 240 sfpm. Ten blades available from 6 to 24 teeth per inch, standard and Hi-Speed Steel.

Take a good look at this Porta-Band Saw and ask your dealer for a free on the job trial. It'll pay its way over and over and over.

FREE CATALOG shows complete line of Porter-Cable tools and accessories. Write: Rockwell Manufacturing Company, Porter-Cable Division, N. Lexington Ave., Pittsburgh 8, Pa.

PORTER-CABLE MACHINE COMPANY
Subsidiary of Rockwell Manufacturing Company
Pittsburgh 8, Pennsylvania

Porter-Cable
another fine product by
ROCKWELL

Circle 593 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

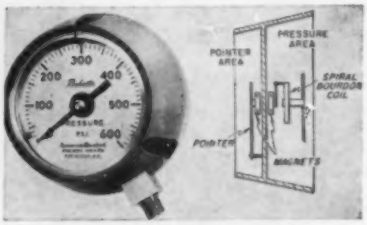
(Begins on page 158)

ble liquid designed primarily to prevent microbiological growths in heat transfer equipment. It minimizes reduction in heat transfer caused by bacterial growth. Biocide 1825 is absorbed and held by cellulosic substances, thus preventing deterioration of wooden tanks etc. It doesn't interfere with scale and corrosion control treatments commonly used, according to company. An organo-metallic complex, effective at low concentrations and consequently low in overall cost, it requires no special feeding equipment and contains antifoam agent. Ionac Chemical Co.

For details, circle 30 on Post Card

SOLID-WALL GAGE designed to end explosion hazard

A cast aluminum wall separates pressure and pointer areas of Model 5130 Safety-Wall Gage to eliminate hazard of gage glass explosions. It uses a magnet attachment to spiral-wound bourdon coil, with magnet attached to coil on one side of the wall and pointer



with another magnet on the other side. Pointer moves in response to pressure demands through magnetic attraction. Usual wear points such as links, pivots, gears or hair springs are eliminated. Gage pressure ranges to 10,000 lb. The gage has a 3½-in dial, is designed to provide accuracy of ½ of 1 per cent of full scale range. Technical Data Sheet 90-44 gives information. American-Standard Controls Div.

For details, circle 31 on Post Card

EPOXY MORTAR KIT features simplified mixing

This kit provides ready-to-use chemical-resistant epoxy grout and mortar in one simple mixing step without adding sand or other components. Advantages claimed include: adjustable plastic tip application cartridges for the caulk gun, producing varying widths of mortar; resistance to lactic and other acids and alkalis; a 4½-hr

You are on the right track here. For the big lifts or ordinary loads Leschen Red-Strand is universally accepted and demanded by wire rope users who expect and get their money's worth. • Constant research and development have provided Leschen users with a complete range of sizes and types for every conceivable task. This versatility, backed by Leschen's distribution and technical services, is your assurance of wire rope dependability for every job. • *Accept nothing less than Leschen.* For the name of your nearest Leschen distributor write: Leschen Wire Rope Division, H. K. Porter Company, Inc., 2727 Hamilton Avenue, St. Louis 12, Missouri.

PORTER ***LESCHEN WIRE ROPE DIVISION***
H. K. PORTER COMPANY, INC.

Circle 594 on postcard, page 33

THE MOST COMPLETE LINE OF MECHANICAL PACKINGS* SOLD THROUGH INDUSTRIAL DISTRIBUTORS

Dependable Local Service •
Always Available •
Prompt Delivery

Find the Belmont Distributor nearest you in Conover-Mast Purchasing Directory

* HIGH PRESSURE ASBESTOS • ROTARY PUMP PACKINGS • VALVE PACKINGS • V-RINGS • LEATHER PACKINGS • SHEET PACKINGS AND GASKETS • HYDRAULIC & PNEUMATIC PACKINGS • METALLIC PACKINGS • PLASTIC PACKINGS • TEFLON PACKINGS & GASKETS • SPIRAL WOUND GASKETS

Better Buy **BELMONT**

THE BELMONT PACKING & RUBBER COMPANY • PHILADELPHIA 37, PA.

Circle 595 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 158)

setting time, at 77F, for light traffic, 12 hr for heavy traffic ; and caulking of vertical and horizontal surfaces without sagging at recommended thicknesses. Standard color is gray; tile red and black may be ordered. Steelcote Mfg. Co.

For details, circle 32 on Post Card

LINE COUPLER permits safe removal of breaker

A line coupler that permits safe, easy removal of circuit breaker and starter equipment is announced for the Spin Top enclosure for hazardous locations. A unit can be removed without dis-

connecting the main power feeder with the coupler. Branch connectors are insulated for safety to personnel, and hot lines cannot come in contact with any part of enclosure. It mounts on a standard circuit breaker using stabs installed in the line terminals. The unit has a 50-amp rating, is designed to withstand same fault currents as the F frame circuit breaker. Square D Co.

For details, circle 33 on Post Card

ZINC RICH COATING protects against rust creepage

Devcon Z, containing 95 per cent zinc and 5 per cent epoxy binders, is claimed the most effective of rust preventives. It seals out moisture and prevents corrosion by galvanic action. Manufacturer explains that if it is scratched through to the iron or steel, the zinc in the presence of moisture forms a galvanic cell with the base metal. The zinc (anode) sacrifices itself to protect the base metal (cathode) and protection lasts as long as zinc is present. The zinc also forms a zinc oxide layer on the exposed metal and thus protects it against further corrosion. The coating is re-

Socony Alumicolor makes big splash in St. Louis

Suppose you owned the second biggest water tank of its kind in the world. How would you protect the huge metal surface, improve appearance, reduce future maintenance —all at the same time? In this precise position, St. Louis County Water Co. very sensibly coated its new Stratman 11,000,000-gal tank with green Socony Alumicolor, made by Socony Paint Products Co., Metuchen, N. J.

Colored aluminum paints are catching on with utility and industrial maintenance people everywhere. Aluminum paint has always been the best protection for weather-exposed property. Now, with color, you can match roofs and buildings . . . make buildings (or tanks) harmonize with surroundings . . . give entire plants uniform good appearance.

Made with Alcoa® Pigments, colored aluminum paints like Alumicolor offer excellent weatherability and corrosion resistance. Colors increase in brilliancy as the coating weathers.

Alcoa does not make colored aluminum paints, but we will be happy to refer you to some competent people who do. For more information about aluminum paints and roof coatings, please send the coupon.

Entertainment at Its Best . . . **ALCOA PREMIERE**
with Fred Astaire as Host . . . Tuesday Evenings, **ABC-TV**

ALCOA ALUMINUM

PIGMENTS, PASTES & POWDERS

Aluminum Company of America
1751-M Alcoa Building, Pittsburgh 19, Pa.

Please send your free booklets:

☐ *Painting With Aluminum in Color*
☐ *Aluminum Roof Coatings Make Time Stand Still*

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Company_____

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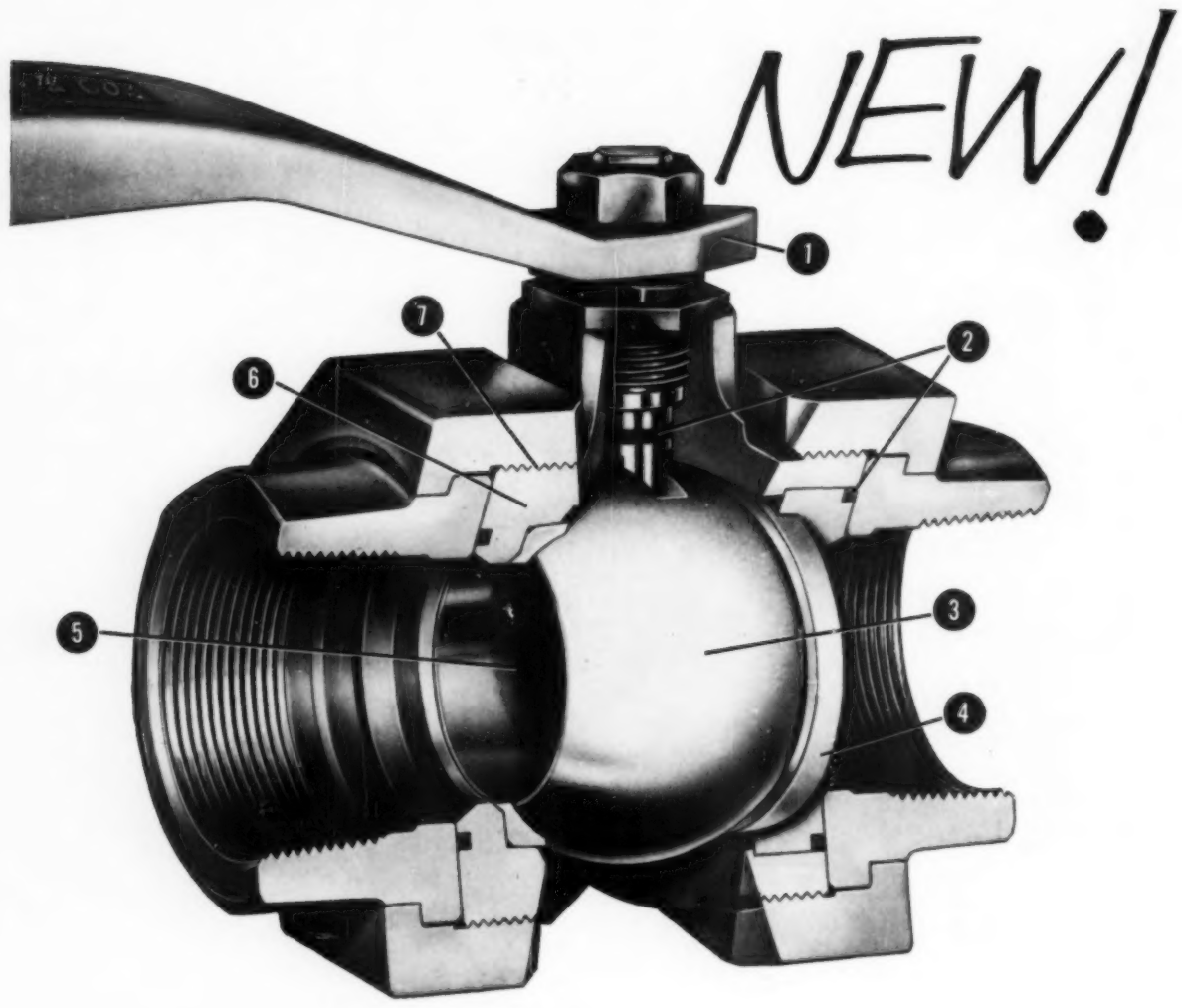
City_____ Zone_____ State_____

Circle 596 on postcard, page 33



PETRO® BALL VALVE

FEATURES DOUBLE UNIONS AT NO EXTRA COST!

After years of thorough research and testing, Clayton Mark has introduced its new PETRO BALL VALVE—with outstanding engineering features and built-in performance, which makes it singularly attractive to almost every piping and valve application. The essence of simplicity, the valve body can be removed without disturbing any other part of the piping . . . in just 13 seconds! The PETRO BALL VALVE is designed with features that make it definitely superior to other valves: ① easy quarter-turn improved handle, ② completely contained seals, ③ floating ball gives tighter seal, ④ interchangeable dual seats, ⑤ largest port opening, ⑥ rust-proof one-piece forging and ⑦ cadmium-plated nuts. And remember—*each and every PETRO BALL VALVE is air-tested under 100 pounds pressure to assure perfect operation.*

Distributorships available on a selective basis

1408

CLAYTON MARK & COMPANY

1900 DEMPSTER STREET · EVANSTON, ILLINOIS · U.S.A.

PUMPS · WATER WELL SUPPLIES · CONDUIT · UNIONS · TUBING

Circle 597 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 158)

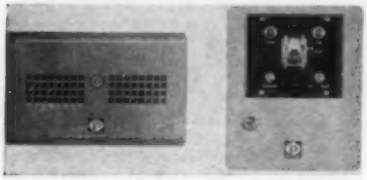
ported effective over rust, provided loose scale is first removed.

Additional advantages announced include long-range economy; resistance to abrasion; high electrical conductivity; and suitability for steel which is to be welded—there are no toxic fumes and the zinc tends to fuse to the steel. Easy to apply, Devcon Z comes in a single container, requires no pre-mixing and can be brushed or sprayed. May be used as a primer. Coverage is given as about 1200 sq ft per gallon. A trial kit—enough for about 75 sq ft—can be had for around $2.00 Bulletin Z-1 gives data. Devcon Corp.

For details, circle 34 on Post Card

ELECTRONIC FENCE detects approach of intruders

Radi-Matic Barrier is designed for perimeter security of large areas. Operating on low frequency, it transmits an electronic wave to detect approach of intruders. Any attempt to crawl



under, cut through or climb over this antenna array is instantly detected and reported to monitor located remotely in guard office, police station etc. Antenna is zoned into sections to pinpoint location of attempted intrusion. System is installed alone, onto existing fence or adapted to rows of multipane windows. It is claimed uneffected by weather conditions, line voltage fluctuations or nearby electrical equipment. Circular 366D gives information on transistor (left), monitor (right) and antenna. The Powers Regulator Co.

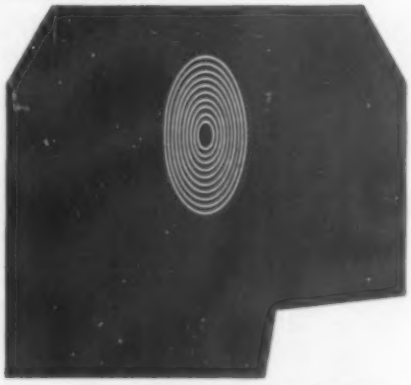
For details, circle 35 on Post Card

AIR RELEASE VALVE for 100-lb liquid systems

No. 69, a low cost vent, designed to eliminate air and gases from pipelines in applications up to 100 lb operating pressure. This valve body is cast iron; valve, seat and float are stainless steel. Installed at highest point in liquid systems, No. 69 automatically and continuously releases air as fast as it accumulates. Applications include: hot

A Westinghouse Metal-Clad Switchgear advantage to you:

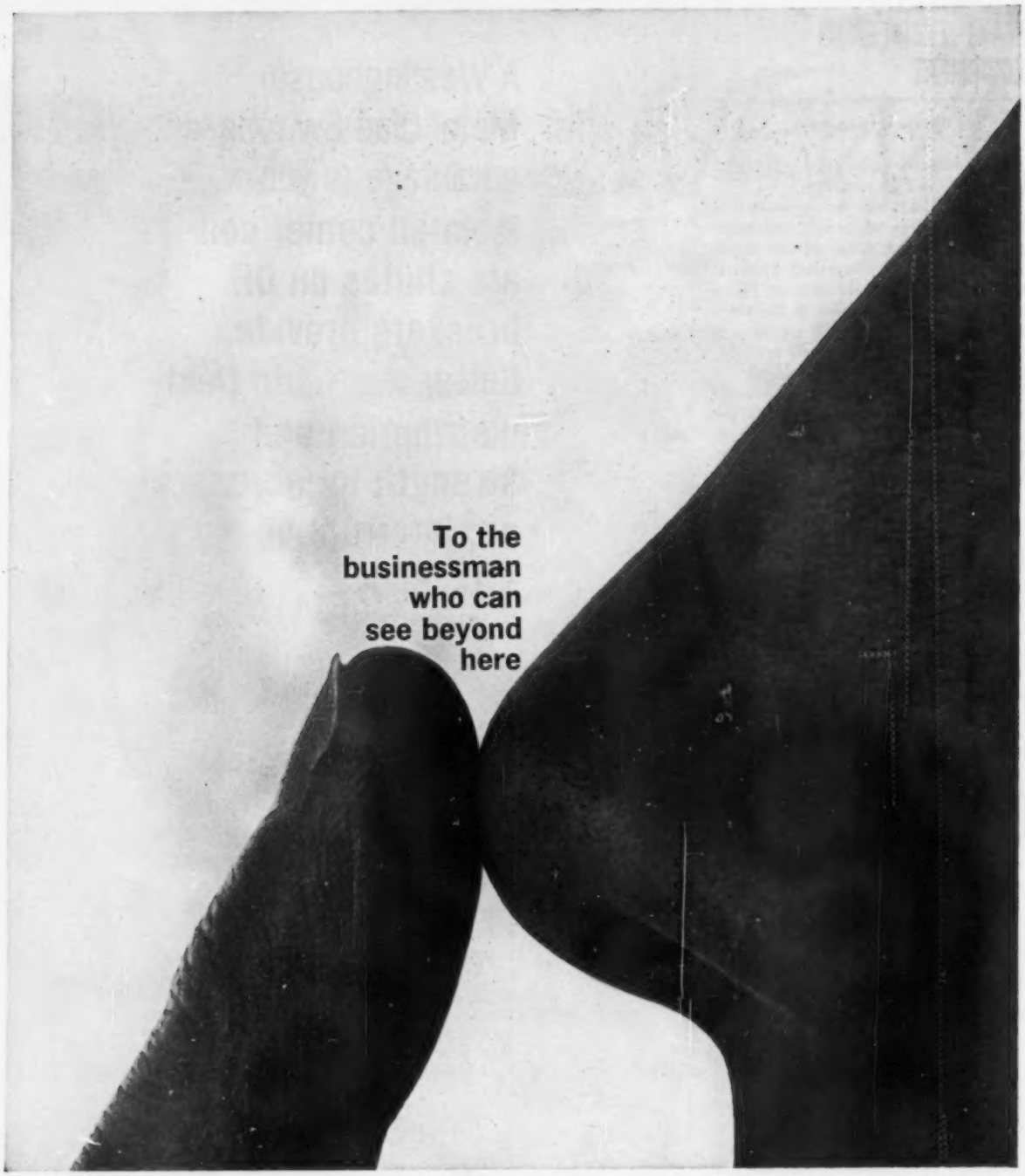
Isolated center coil arc chutes on DH breakers provide better magnetic field distribution and strength to increase arc interruption efficiency



For complete facts on Westinghouse metal-clad switchgear using DH magnetic air circuit breakers, contact your Westinghouse representative or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.
You can be sure ... if it's **Westinghouse**

J-61019

Circle 598 on postcard, page 33



Our population is growing, moving, shifting. And more people than ever need more goods—opening new areas in which to build your business, to provide more jobs in America's growing economy.

But how? And where? These key questions are answered best by marketing research, often costly and time-consuming. But it doesn't have to be. And it isn't—if you consult your U.S. Department of Commerce. On file, it has a 135-million-dollar fund of marketing data—vital and valuable up-to-date facts. Yours for the asking.

You'll find information in depth on U.S. business, manufacturers, housing and many other basic aspects of marketing. It will help you pinpoint your profit potential and select the best areas for your product, industry or service. (A detailed study of 750,000 blocks in 475 cities will even help you find the ideal corner for a retail outlet.)

Take advantage of the many ways in which your business can grow. In new U.S. markets. In foreign markets. In developing new products and services. In attracting new industry to your community. Just write or phone the U.S. Department of Commerce Office of Field Services in your city, or Washington 25, D.C. Your U.S. Department of Commerce is always ready to help you grow with America!

NOW'S THE TIME TO GET GROWING IN A GROWING AMERICA!

PLANT ENGINEERING EQUIPMENT

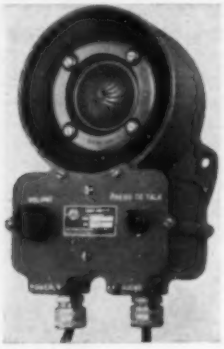
(Begins on page 158)

water heating systems, chilled water systems, air conditioning systems, filters or any individual pipeline or equipment carrying liquid. Data Sheet S-2883-100G gives information. The V. D. Anderson Co.

For details, circle 36 on Post Card

INTERCOM SYSTEM for the high noise areas

The Adco Intercom System is designed for communication in high-noise areas such as steel mills. Only one unit per station is required—the switch lever acts as the receiver-sending device.



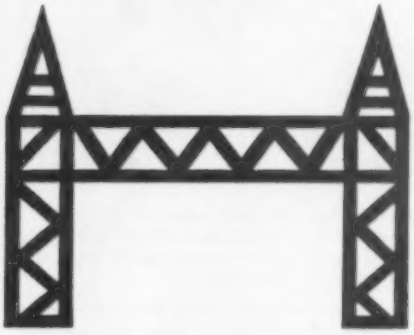
Installation is easy, company says. Simply hang intercom on wall or post, string two-wire electric cord between units and plug into power line, generator or battery. Units may be miles apart or close, indoors or out—they're housed in weatherproof aluminum casting. All units receive but selective tone signals may be engineered into the system. System is completely transistorized, 12v d-c or 117v a-c, 60 cycles. Atkinson Dynamics.

For details, circle 37 on Post Card

UNIT HEATERS are light, compact, accessible

For automatically controlled heating applications, gas-fired propeller-fan type Series NF Units come in ten basic sizes with capacities from 25,000 to 250,000 Btu per hour input. They're smaller and lighter than conventional gas-fired units, require minimum space in the working zone and achieve maximum headroom due to low overall height. Lower maintenance cost is attributed to the face-mounted, direct-connected electric drive motor. Internal mechanical starting switches aren't required. The heater is automatically controlled through a room

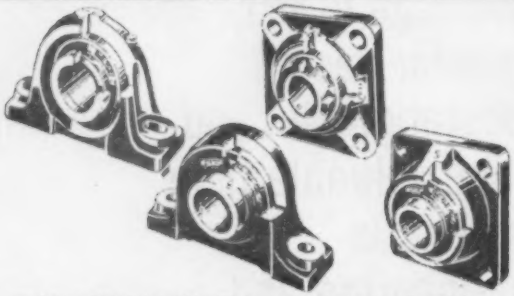
A Westinghouse Outdoor Substation advantage to you: **Modular design substations let you make valuable time savings in engineering and erection, require minimum plot area and steel**



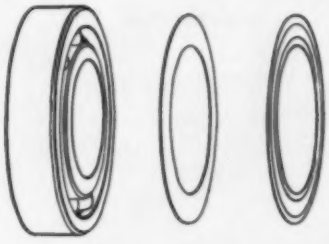
For complete facts on modular design outdoor substations, contact your local Westinghouse representative or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.
You can be sure... if it's **Westinghouse**
J-61020

Circle 600 on postcard, page 33

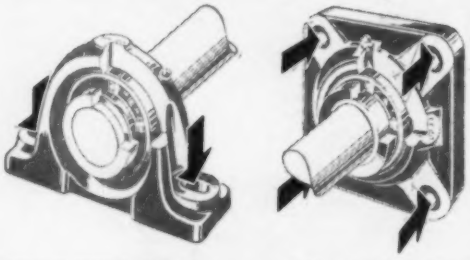
DISTRIBUTOR DAN, the SKF bearing man, shows how SKF PILLOW BLOCKS AND FLANGED MOUNTINGS eliminate 5 pesky maintenance problems



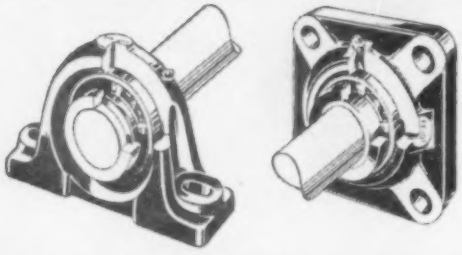
NO MORE FOOLING WITH FITS because SKF makes 27 sizes of unit pillow blocks for shafts ranging from ¾" to 4" dia.—and flanged mountings for 24 shaft sizes from ¾" to 2 15/16" dia. Most sizes are available with set screw or eccentric locking collars.



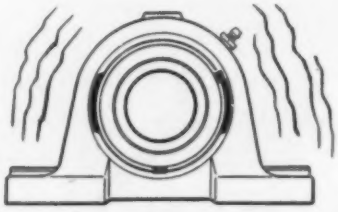
SOLVES SEALING PROBLEMS. Both units are prelubricated and equipped with seals that really seal. The red washer is made of tough, durable DuPont "Fairprene"—backed by a sturdy metal plate. Rotating flinger actually flings dirt away from the bearing.



EASILY INTERCHANGEABLE. You can quickly substitute SKF units for other worn-out or damaged mountings. Bolthole spacing and center heights are designed so that the units can be interchanged with other mountings of similar design.



MOUNTING MADE EASY. You can install these pillow blocks and flanged mountings in minutes! Because, the spherical outer ring provides easy initial alignment—compensates for misalignment. Separate locking collar and set screws ensure fast adjustment.



RARELY NEED REPLACING. SKF Unit Pillow Blocks and Flanged Mountings are competitively priced. Yet their cast one-piece housings last longer—withstand all types of shock and abuse. Units rarely need relubrication or replacing.

YOUR AUTHORIZED SKF DISTRIBUTOR stocks a full line of these unit pillow blocks and flanged mountings. Ask him to show you exactly why they're your best buy. And remember—for the best in bearings—deal only with an Authorized SKF Distributer.

SKF MOTION ENGINEERING

Advanced ball and roller bearing technology

Circle 601 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 158)

thermostat. A summer-winter switch is provided for operation of fan for summer ventilation. Industrial Div., American-Standard.

For details, circle 38 on Post Card

PIPE REPAIR CLAMP accommodates misalignment

Dresser 360 All-Around Clamp is a wrap-around pipe repair clamp with bolts on one side and a thick, butt-seal rubber gasket. It provides a 3/8-in. adjustment on diameter so that a single clamp fits a large number of pipe diam-

eters. For the repair of holes, circumferential breaks or splits, this clamp can be used on both rough barrel or machined ends of asbestos-cement pipe, and on the run of cast-iron and steel pipe. Also, it may be used where pipe ends are deflected up to 4 deg or offset 1/8 in. A sectional lug and the gasket design allow use for joining pipes of up to 1/4 in. difference in outside diameter, and a thick spanner plate supports the gasket so pipes may be connected with as much as 1-in. gap between pipe ends. Clamp comes in sizes from 2 to 12 in., for pipes with outside diameters from 2.38 to 14.50 in. Clamp widths vary from 6 to 30 in. Dresser Mfg. Div., Dresser Industries, Inc.

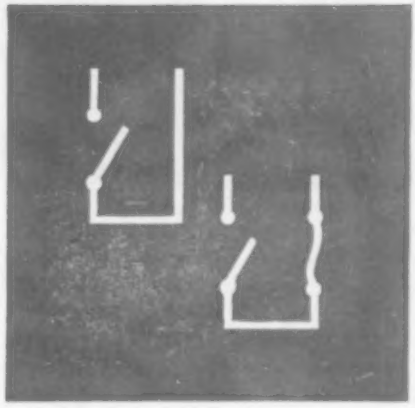
For details, circle 39 on Post Card

HEATING/COOLING system offers flexibility of installation

Flexibility of components of the All-Seasons System provides heating and cooling for a wide range of single-story structures. Its design makes space-saving possible with low side equipment for ceiling suspension, high side components for roof installation or in a room remote from conditioned area. Features include: packaged components for economical installation; a central control station for remote operation; and gas-fired warm air heating with no gas lines in the conditioned area. Systems are available in 16 com-

A Westinghouse Switchgear advantage to you:

Component selection in DFS drawout switch and fuse switchgear provides maximum application flexibility

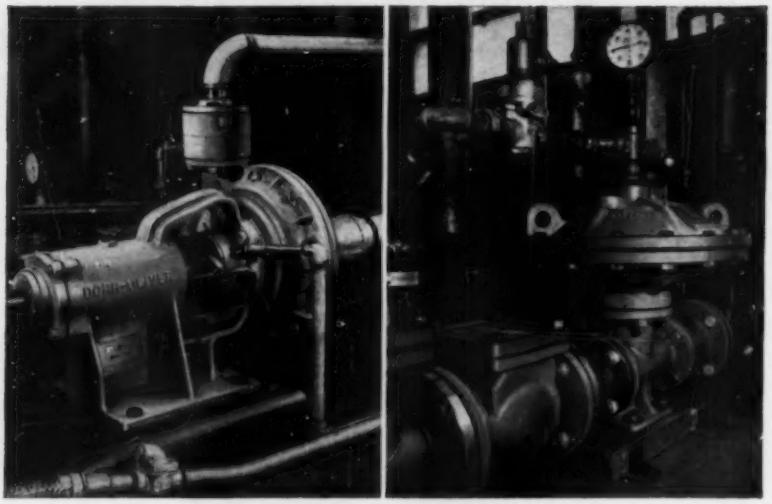


For complete facts on DFS drawout switch and fuse switchgear, contact your local Westinghouse representative or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.
You can be sure . . . if it's Westinghouse
J-61021

Circle 602 on postcard, page 33

DORR-OLIVER SPECIALIZED PUMPS

solve widely different problems at Vanderbilt Chemical



Important end products at Vanderbilt Chemical Corporation, East Norwalk, Conn., are metallic based dimethyldithiocarbamates and diethyldithiocarbamates for use in natural rubber and butadiene styrene rubber products.

Processing operations involve problems requiring two entirely different types of pumps, each adapted for highly specialized service. Vanderbilt Chemical solves these problems with the two Dorr-Oliver pumps shown above. At left is the Olivite® lined centrifugal, designed for safe handling of highly corrosive and similar problem liquids. At right is the ODS® diaphragm type pump, designed for transfer of slurries with a high percentage of suspended abrasives.

Twelve Dorr-Oliver units are now in operation at Vanderbilt Chemical – all with the trouble free, low maintenance characteristics inherent in equipment of Dorr-Oliver design and manufacture. Dorr-Oliver is the only major manufacturer offering three distinctly different pumps designed for chemical process applications – the lined Olivite centrifugal, alloy centrifugal, and ODS diaphragm type.

For full information on the right unit for your special application, write to Dorr-Oliver Incorporated, Stamford, Connecticut.

DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

Circle 603 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 158)

binations ranging from 15 to 30 tons cooling, 175,000 to 450,000 Btu/hr heating. Form 6025 gives information. Dunham-Bush, Inc.

For details, circle 40 on Post Card

WIRING SYSTEM installs on, not in, the wall

G-E Flexway is a metal, surface raceway, wiring system intended to replace conventional baseboard and doorway trim. It can be installed as a wall chair-rail or mounted on benches near machines. Components include 15-amp 125/277-v switches; 15- or 20-amp 125-v and 15 amp 250-v grounding outlets that can be split for two-circuit

or split controlled outlets. Outlets and switches mount directly in the raceway at any spacing or location. Outlets have insulation-piercing terminals that make electrical connections to No. 12 or 14 Awg wire without removing the insulation, and to No. 10 Awg wire by stripping it. Outlets are automatically grounded to the metal raceway which provides for carrying ground connection through splices and fittings. If required, a second separate grounding wire can be connected to the grounding screw. The system has capacity for wire sizes from ten No. 10 Awg wires to three No. 6 Awg wires. Outlets can be moved at any time without cutting or altering existing wiring. General Electric Co.

For details, circle 41 on Post Card

CORE BINDER is quick setting, wet mix

Fast-curing modified liquid phenolic resins and accelerators are announced for use as core binders in high-volume, high-speed foundry operations. The simple wet mix used requires only resin, accelerator and sand—prepared in any standard muller. According to manu-

Lou Krakowski, General Superintendent of the Harrison Sheet Steel Company, is a guy who makes no bones about what he wants. It's service! And, for twenty years, he has been getting what he considers the best . . . Cities Service.

Turning out, among many other things, 125 steel desks a day, he wants complete and dependable lubrication service. One of the many Cities Service products he uses to get this job done is Trojan H-2 grease. For general greasing on all equipment, multi-purpose Trojan H grease has a wide range of application. And, because of the variety of jobs Trojan H grease does, it reduces his necessary lubrication stocks.

If you have to *get it on the line* . . . call your nearest Cities Service office . . . or write Cities Service Oil Company, 60 Wall Street, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Circle 604 on postcard, page 33

improves metal finishing by cleaning and phosphating in one easy operation

MALSBARY STEAM CLEANER offers you an effective, cost-cutting, space-saving system for improving paint adhesion and protecting metals against rust—in one easy operation. Here's how:

In the plant pictured above, the entire finishing operation—steam cleaning, phosphating, painting—is handled in a 20′ x 15′ spray booth. Note the grating, which provides good work surface and permits excess spray to drain into tank beneath, whence it is pumped to a sump 75′ away. The steam cleaner is a compact model 150, 45″ x 21″ x 43″ high, remote controlled from a cleaning gun equipped with easy-squeeze lever which gives operator control of stop and start cleaning action *at the work site.* The cleaner itself sits 100′ away, in an area where it's available for maintenance cleaning.

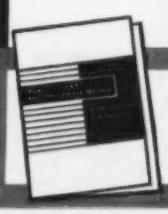
This cleaning-phosphating-painting setup requires much less investment than the usual conveyor spray-rinse or dip system, and is more flexible. You can handle varied shapes, sizes and quantities at any one time. No rinse is needed; residual heat in metal quickly dries surface for painting.

Malsbary makes cleaners in sizes from 80 gph at 60-100 psi to 2100 gph at 400 psi, for every cleaning need. For the type and size best suited to your operation, consult Malsbary dealer nearest you—or write us.

#160

MALSBARY

MALSBARY MANUFACTURING COMPANY
845 - 92nd Avenue, Oakland 3, California • Highway 119 North, Uniontown, Pennsylvania



FREE 16-page illustrated booklet, "How to Clean and Phosphate Metals in One Operation at Low Cost." Also, "Spray Booth Drawings." Write for either or both today.

Circle 605 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 158)

facturer, cure time in the hot core box may be 15 sec or less at 500 F to produce moisture resistant cores of exceptional dimensional stability, long shelf life, high resistance to overcure. In the production of iron and nonferrous castings, these binders leave a carbon bond, producing a longer core stability period resulting in smoother casting surfaces. Durez Plastics Div., Hooker Chemical Corp.

For details, circle 42 on Post Card

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 33-34.

COMPACT VEHICLE travels all around the plant

Mini Scrambler, a lightweight, portable scooterette, operates under conditions prohibitive to a full-scaled ve-

hicle, yet is capable of 35 mph on smooth highways. It weighs only 75 lb, is 50 in. long and is powered with a 2-hp four-cycle air-cooled engine. Features include positive centrifugal clutch, final chain drive. Costs about $140.00. Wood Plastics Co.

For details, circle 43 on Post Card

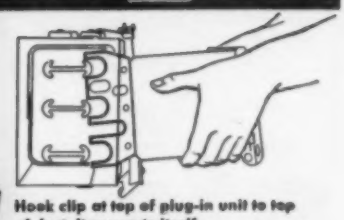
EXIT LIGHT has self-charger, secondary power circuit

Light Warden Chargomatic Model 33, a wet-battery emergency exit light, is a self-contained unit with a 6-v, 22 amp-hr, lead acid battery with automatic charger, a normal circuit to operate from 115 v a-c, and a secondary circuit operating on 6 v d-c in event of power failure in the regular circuit. The emergency circuit is acti-

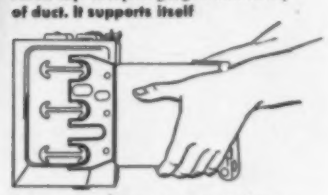
Why SQUARE D ALUMINUM PLUG-IN DUCT?

Because you want a duct that's rugged – built to thrive on heavy duty – *plus*

PLUG-IN UNITS GIVE YOU EXCLUSIVE *hook-swing* MOUNTING



Hook clip at top of plug-in unit to top of duct. It supports itself



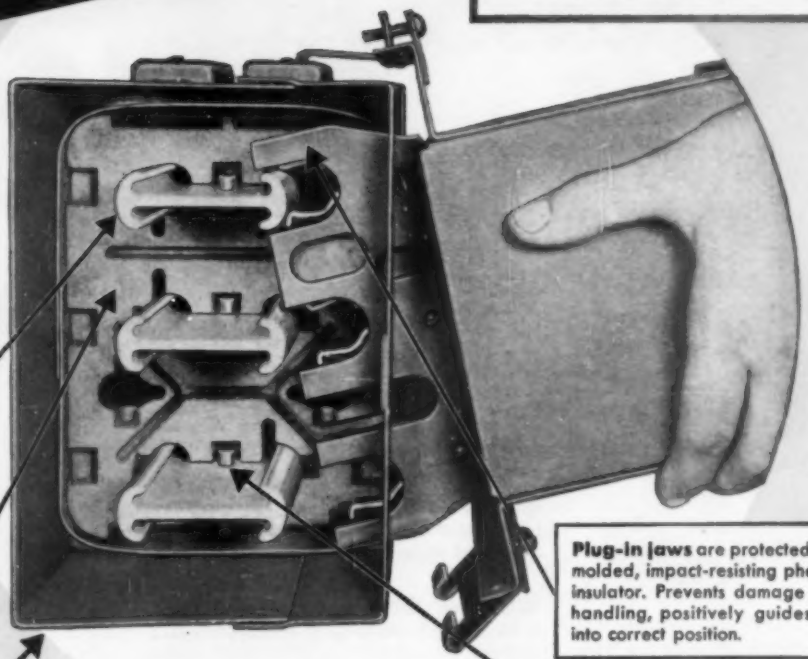
Then, just swing plug-in unit down until jaws engage bus bars

Hanger mounting (*not shown*) makes installation easy. A universal hanger permits mounting in *any* position. Just suspend and level top portion of hanger, then clip on lower portion. U.L. approved for 10-foot spacing.

I-beam construction of bus bars—a Square D exclusive—provides four times the strength of conventional bus bars. Bars are zinc, copper and silver-plated full length.

Full width bus support provides greater strength on short circuits, freedom from vibration. Also acts as fire stop where duct passes through walls and floors.

Square D duct is totally enclosed for maximum safety—no danger of accidental shorts. Prevents overheating from dust accumulation.



Plug-in jaws are protected by a molded, impact-resisting phenolic insulator. Prevents damage from handling, positively guides unit into correct position.

Steel pins in each bus bar prevent bars from shifting and support them on vertical riser installations.

With other plug-in duct, it's no easy job to mount the plug-in units. In fact, it takes a lot of real pushing which is neither safe nor easy when you're working on a ladder. With Square D's exclusive *hook-swing* mounting, you just hook the plug-in unit to the top of the duct. Then, simply swing it down and in until the jaws have engaged the bus bars. No awkward pushing required—no unnecessary chances to take. Compare Square D's rugged, heavy-duty construction with any other. It costs no more—why settle for less?

Write for Bulletin SD-110. It gives the facts on Square D aluminum plug-in duct. Address Square D Company, Mercer Road, Lexington, Kentucky

SQUARE D COMPANY

wherever electricity is distributed and controlled

Circle 606 on postcard, page 33

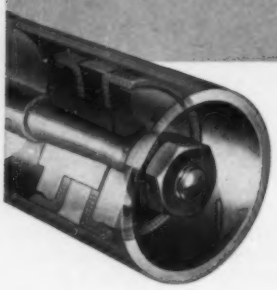
DARCOVA

PUMCUPS

pressure-seal automatically

for maximum efficiency

and longest service life



Pistons are made in a wide range of sizes in bronze, steel, aluminum or iron.

Our sales engineers will be glad to work with you on your designs. Write, wire or phone for Darcova service.

● Virtually no slippage—fluid or air pressure keeps cup in close contact with liner automatically, regardless of wear.

● No need for "jammed in" packing—close tolerance of cup (.005") provides uniformly tight seal around entire perimeter.

When you design hydraulic and pneumatic mechanisms or reciprocating pumps, be certain of maximum performance—specify Darcova Pumcups and Pistons.

Pumcups operate at full efficiency throughout their entire life—*outlast ordinary packings at least 3 to 1!* And they perform equally well in air, oil, water, glycerine, alcohol, and other fluids common to hydraulic systems.

Pumcups are available in three textures—hard, medium and soft, in regular or nylon composition. Sizes range from ¾" to 20".

DARLING VALVE & MANUFACTURING CO.

Williamsport 14, Pa.

DARCOVA THE ORIGINAL COMPOSITION CUP

TRADE MARK PUMCUPS

Circle 607 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

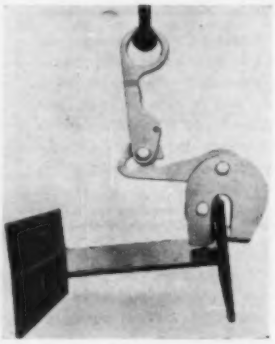
(Begins on page 158)

vated by relays held normally open with house current in the energizing coil. When power fails the relay closes and the battery circuit is activated for emergency burning for up to 6 hr of continuous use. Available for surface, wall or ceiling mounting. Standard unit has red glass with 6-in. white letters. Electric Cord Co.

For details, circle 44 on Post Card

LIFTING CLAMPS handle I-beam and structural shapes

Model STL and ST Clamps have a gripping ratio of 3¼ to 1, and a safety factor of 5 to 1 overload rating. Mod-

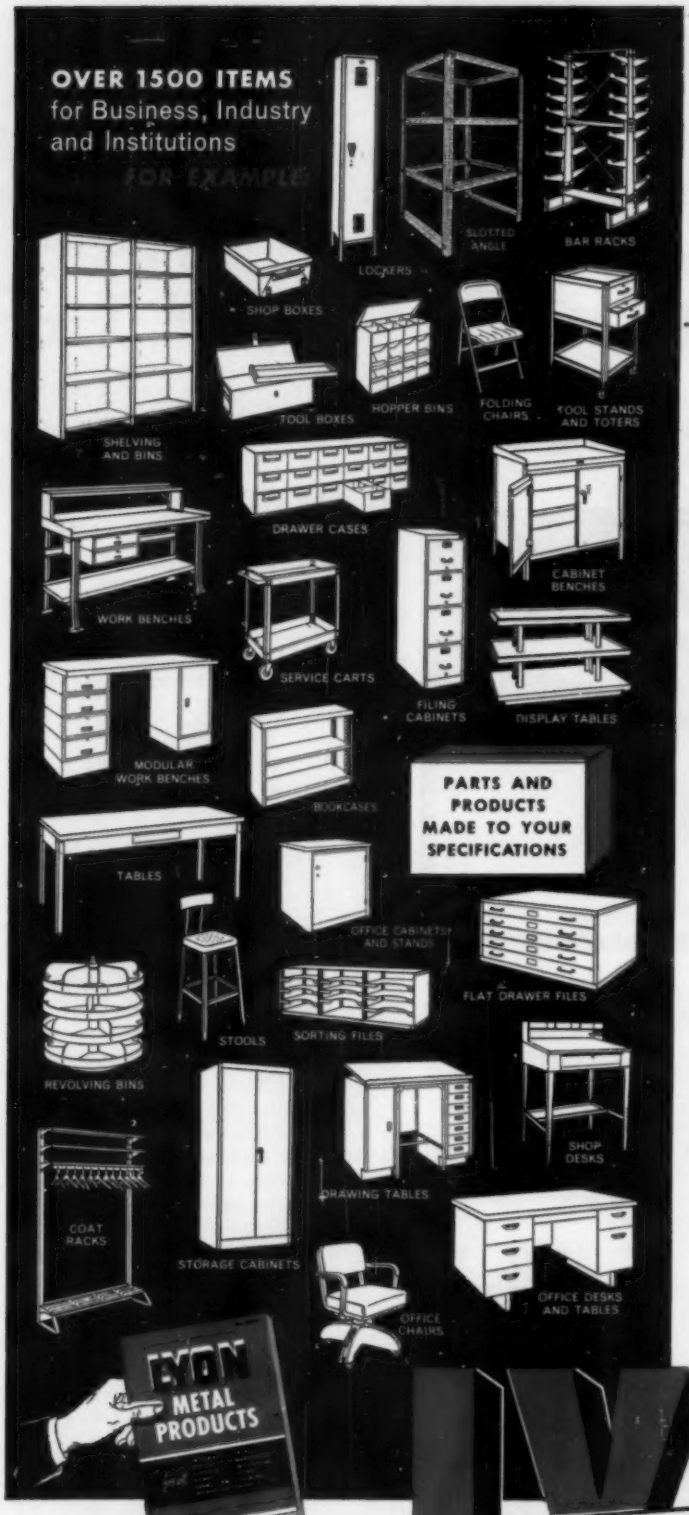


el STL (shown) has an automatic release mechanism which allows crane to disengage clamp without additional help from ground. Model ST can lift, handle and position structural shapes without lock open feature. J. C. Renfroe & Sons, Inc.

For details, circle 45 on Post Card

NICKEL-IRON BATTERIES for heavy-duty trucks

Design innovations in the Type E Exide Batteries have boosted electrical capacities nearly 77 per cent, according to manufacturer, enabling them to match the capacity of some of the most powerful lead-acid batteries for electrical trucks. Like previous nickel-iron-alkaline batteries, these produce current by the transfer of oxygen from the nickel oxide of the positive plate to the sponge iron of the negative plate. But because their design makes more efficient use of available space, they can produce 100 amp-hr per positive plate. They produce 1.202 w-hr per cubic inch, up from 0.68 w-hr in the former design. They are still 22⅝ in. high—require no alterations in standard com-



THIS CATALOG ILLUSTRATES
THE WORLD'S MOST
DIVERSIFIED LINE
OF STEEL EQUIPMENT
IT'S FREE!

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1291 Monroe Ave., Aurora, Ill.

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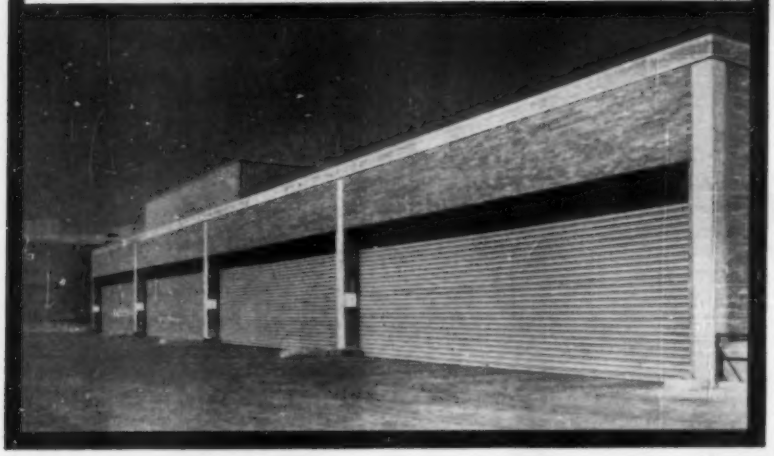
Circle 608 on postcard, page 33

now

MAHON ADDS A NEW DIMENSION TO ROLLING STEEL DOORS

...7-INCH WIDE SLATS FOR HEAVY-DUTY USE



Newest addition to the family of Rolling Doors from Mahon is a curtain design that fills a real need in many door applications. It uses 7-inch-wide interlocking slats of heavy (16- or 14-gage) Bonderized steel to provide *extra-long life in hard and constant usage.* These new Mahon Rolling Steel Doors have been proven-in-use to be economically and functionally ideal for industrial plants, railroad, truck and maritime warehouses and similar installations, particularly involving extra-wide door openings. Shown: Four of the new Mahon Doors—these are 48′ 5″ x 15′ 6″ sizes. Write for information.

MAHON BUILDS A COMPLETE LINE OF ROLLING DOORS IN GALVANIZED OR STAINLESS STEEL, ALUMINUM OR BRONZE—MANUALLY, MECHANICALLY OR POWER-OPERATED MODELS IN STANDARD, UNDERWRITERS' LABELED, OR SPECIAL TYPES.

SEND FOR CATALOG C-60 OR SEE SWEET'S FILES.

THE R. C. MAHON COMPANY *Detroit 34, Michigan*

MANUFACTURING PLANTS—Detroit, Michigan and Torrance, California
SALES-ENGINEERING OFFICES—Detroit, New York, Chicago, San Francisco and Torrance.
Representatives in all principal cities.

MAHON

Circle 609 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 158)

partments of most trucks.

The capacity increase is expected to enable many types of trucks to work harder and longer shifts with less frequent battery charging and smaller trucks to handle the heavier loads. Initially the line will come in five standard sizes from 400 to 800 amp-hr capacities, for trucks rated to 8000-lb. lifting capacities. Exide Industrial Marketing Div., The Electric Storage Battery Co.

For details, circle 46 on Post Card

DEAERATOR reduces oxygen content of boiler water

Corrosive oxygen in boiler feed water is reduced to less than 0.005 cc/liter in the Boilermate Deaerator. The packed column deaerator spreads raw water into thin layers by a self-cleaning nozzle and tray-type exchange

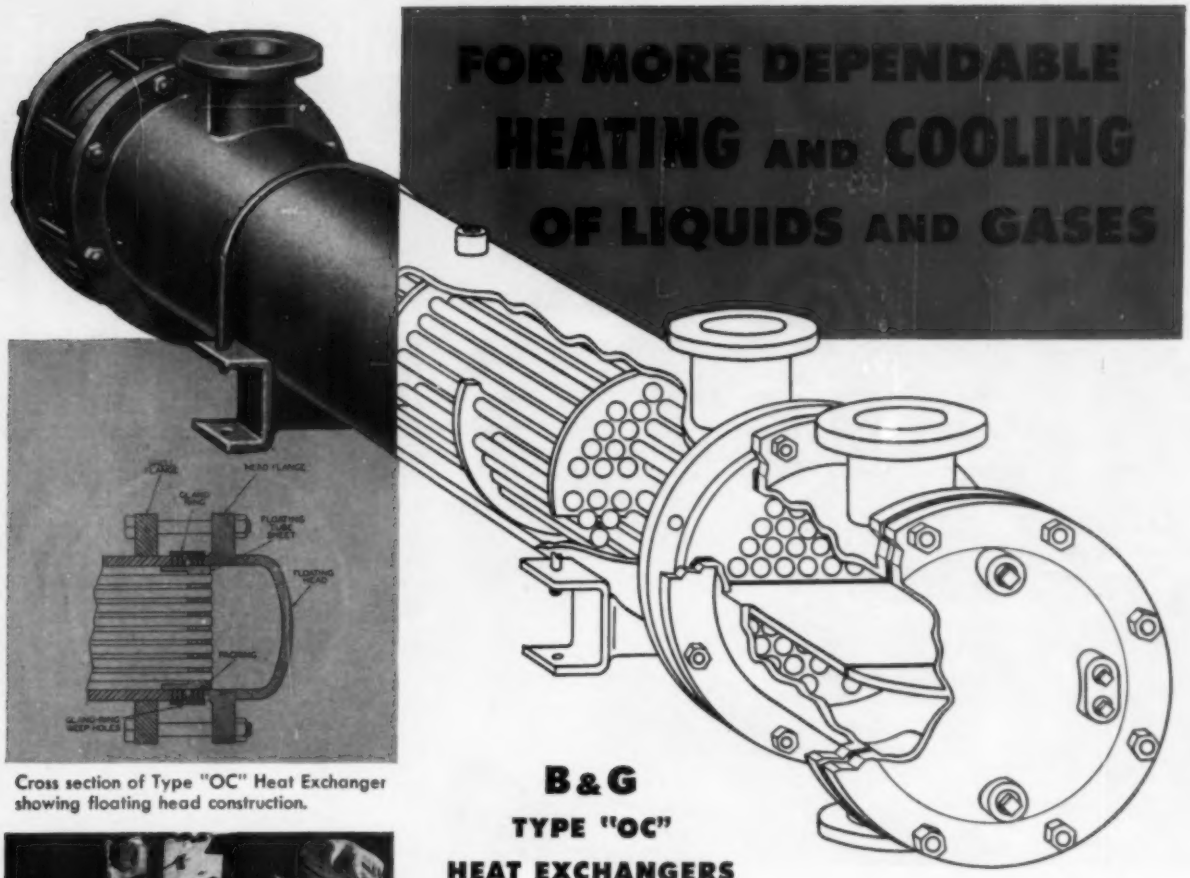
packing. Steam, moving in counterflow to the water, then scrubs out dissolved oxygen and carbon dioxide. Exchange packing material serves as individual trays, exposing a maximum water surface to the steam, yet requires no maintenance. Unit uses automatic variable vent, operates on waste exhaust steam at 5 lb pressure, as well as on steam from boiler. It comes in models from 1,500 lb-hr at 50 F to 55,000 lb at 150 F. Carbon steel storage tanks hold from 53 to 1,012 gal deaerated water. Aqua-Chem, Inc.

For details, circle 47 on Post Card

SELF-CLEANING FILTER uses permanent media

For filtering a uniformly high volume of air with low resistance, the Constant Flow Air Filter has a self-cleaning mechanism to remove impinged solids from filter surface. To achieve constant flow, a stripper traverses

FOR MORE DEPENDABLE HEATING AND COOLING OF LIQUIDS AND GASES



Cross section of Type "OC" Heat Exchanger showing floating head construction.

B&G TYPE "OC" HEAT EXCHANGERS

B&G Heat Exchangers are welded in specially designed fixtures by expert workmen.

All B&G Heat Exchangers are built to A.S.M.E. Code requirements and are so stamped.

For heating or cooling a wide variety of liquids and gases, "OC" Heat Exchangers offer numerous design and construction features which are a warranty of long life and efficient performance.

These units have removable tube bundles with an internally packed floating head. Sizes range from 6″ through 30″ diameters, lengths from 2′ through 20′. Standard material includes steel shells and tube sheets, cast iron heads and copper tubes. Stainless steel tubes, tube sheets and heads are also available. The design of "OC" exchangers may be varied for channel or bonnet heads in both single and two-pass construction.

B&G "OC" Heat Exchangers are not only engineered to top efficiency but are constructed to the uncompromising standards of quality and safety demanded by the A.S.M.E. Code.

With each B&G "OC" Exchanger, a Manufacturer's Data Report for Unfired Pressure Vessels, Form No. U-1, as required by the A.S.M.E. Code rules, is furnished. This form is signed by a qualified inspector, holding a National Board Commission, certifying that the construction conforms to the latest A.S.M.E. Code for unfired pressure vessels. The A.S.M.E. "U" symbol is stamped on each exchanger.

These exchangers are custom-designed units, built to your specifications. Inquiries are invited.

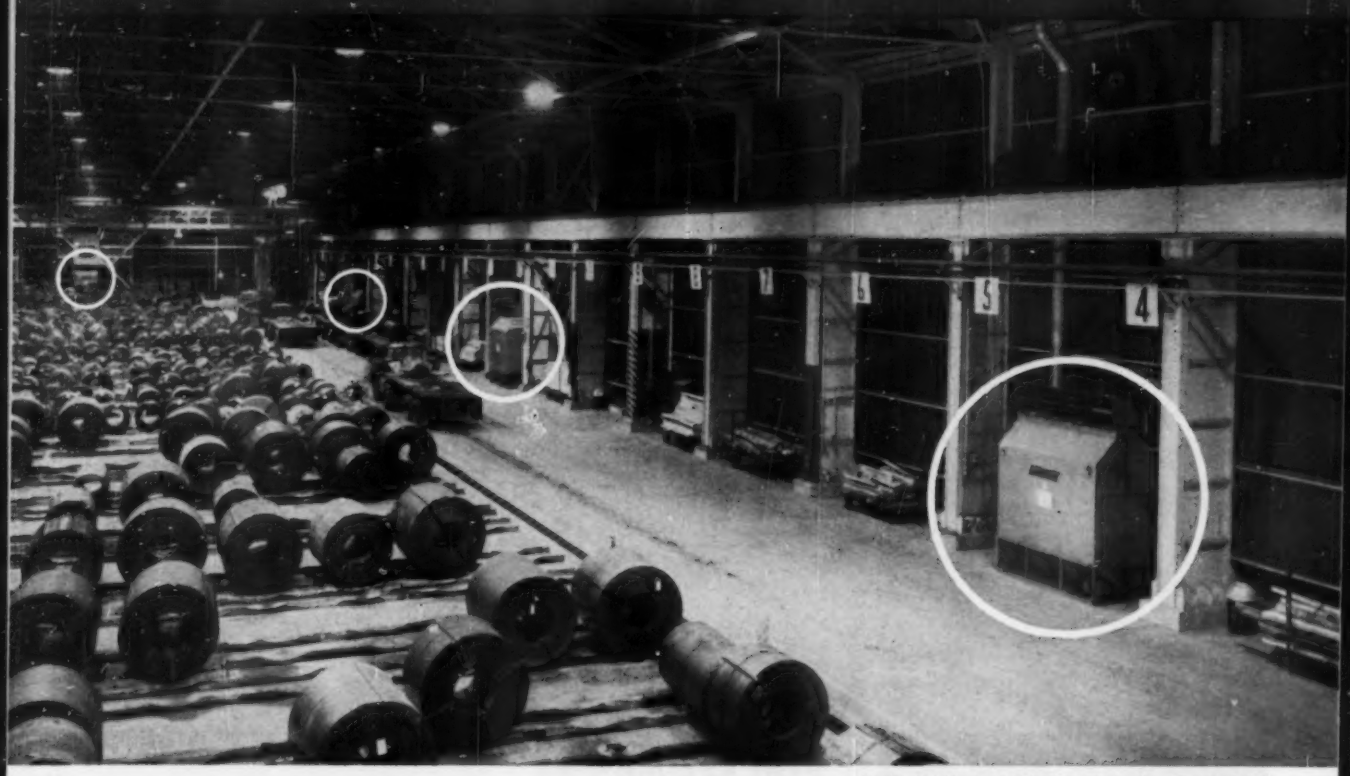
BELL & GOSSETT
COMPANY
Dept. GX-53, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

Circle 610 on postcard, page 33

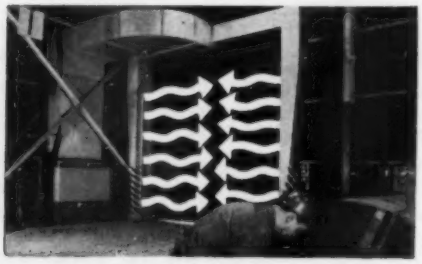
another *LENNOX* installation

DESIGNED TO DO MORE THAN JUST HEAT AIR



Mechanical Contractor: Switzer-Dipple Co., Cleveland, Ohio

Lennox industrial systems provide complete comfort including ventilation, make-up air, fresh air and cooling



How to eliminate "open door" drafts

Expensive and undesirable drafty areas are created by outside doors which open frequently. (18° air, moving at 15 m.p.h., cools hands and faces just as much as still air at −40°.) Such conditions are intolerable to workers, cuts productivity. This company's engineers solved the problem inexpensively with "door heaters" as pictured. Ducts from the Lennox heater release jets of warm air to blanket the door opening. Cold air is tempered before it can affect workers.

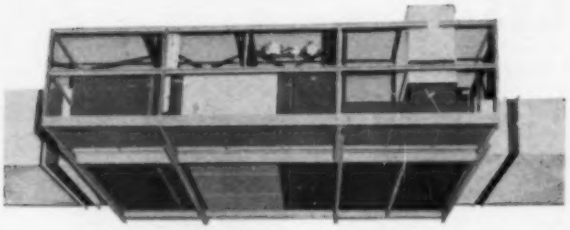
Most industrial buildings, such as the Jones & Laughlin storage and shipping building pictured above, can be expensive to heat. Some heating systems simply "dump" heated air into the working area of these buildings, and others attempt to heat "spots." These systems waste heat, cause drafts, create "hot heads and cold feet," and many times high ceiling temperatures. Lennox industrial heaters overcome these faults. Large capacity blowers and low internal resistance of the heaters make it possible to discharge large volumes of high velocity air *above* the heads of the workers. This produces complete air distribution, eliminating hot spots and uneven temperatures. These units are designed to supply fresh air ventilation and make-up air as required. Cooling equipment can also be added to each of these heaters to provide complete air conditioning. If you would like to receive more information about the Lennox line of industrial heating and cooling equipment, write LENNOX, 611 S. 12th Ave., Marshalltown, Iowa.

LENNOX: A Single Source for Heating, Ventilating and Air Conditioning

Circle 611 on postcard, page 33

Ductless installation in 102,000 sq. ft. food warehouse kept initial costs down... Lennox efficiency cuts operating costs

This company had previously used conventional suspended unit heaters, but switched to Lennox direct-fired heaters to get more even heating and tempered fresh air for ventilation. Three highly efficient Lennox units now heat and ventilate the entire area of the warehouse, with a minimum temperature differential throughout the building.



You can heat, cool or ventilate any existing building with Lennox equipment

The complete line of Lennox equipment, and your Lennox representative will make your designing and buying job easier . . . providing one central source for direct-fired heaters with up to 2,000,000 Btuh capacity, and cooling and ventilating for any job.

Don't be satisfied with less than

LENNOX

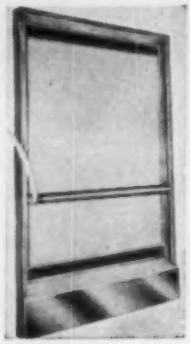
Heats • Cools • Treats and Moves Air

IN HOMES IN CHURCHES IN SCHOOLS IN BUSINESS IN INDUSTRY

LENNOX INDUSTRIES INC., FOUNDED 1895 — MARSHALLTOWN AND DES MOINES, IOWA; COLUMBUS, OHIO; SYRACUSE, NEW YORK; DECATUR, GEORGIA; FT. WORTH, TEXAS; SALT LAKE CITY, UTAH; LOS ANGELES, CALIFORNIA. LENNOX INDUSTRIES (CANADA) LTD. — TORONTO, MONTREAL, CALGARY, VANCOUVER, WINNIPEG.

PLANT ENGINEERING EQUIPMENT

(Begins on page 158)

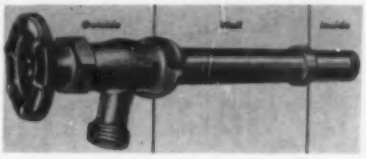


permanent filter surface on a governable cycle. A flexible hose connects moving stripper to vacuum and disposal container. Any suitable filter material can be used, and as requirements change the proper filter material can be installed. Filters can be installed over existing housings, independently or in co-ordination with electrostatic precipitators, moving curtain filters, roll-type, self-renewing filters, and for replacement of stationary filters. Honan Associates, Inc.

For details, circle 48 on Post Card

OUTSIDE FAUCET with "freeze protection"

Frost-Proof Faucet is installed and works like any other outside water shutoff but it shuts off water inside the building, by means of an extension tube and valve seat, eliminating inside cutoff valves. And, since no water reaches



the freezing zone outside sill cocks and lines do not have to be turned off and drained. It also makes water always available for emergency use. Faucets come in 4- to 18-in. lengths. Bulletin LL-8841 gives information. Mansfield Sanitary, Inc.

For details, circle 49 on Post Card

UNION-COUPLING permits quick make

Being a union in itself, Quikupl affords simple and quick disassembly and reassembly with an ordinary wrench. Low in first cost, it minimizes expense for systems requiring frequent disassembly. It is designed for metal and plastic pipe and tubing ½ to 6 in., consists of a cylindrical connector piece into which pipe, tube or fitting ends fit and which acts as a bearing surface and assures proper alignment. Pipe, tubing or fitting ends are held by a nut against a Neoprene or Teflon gasket. Only gasket is in contact with product flowing through, providing straight-through, unrestricted flow. Cooper Alloy Corp.

For details, circle 50 on Post Card

TABLE SERVERS keep food hot in open areas

Designed for cafeteria counters and volume feeding installations, Infra-Red Table Servers come with heat top and bottom and operate on 110-120 v, 60-cycle, single-phase a-c. An adjustable support arm mounted over the base is available with hoods to hold 250-w infra-red lamps or 650-w Circline quartz lamp. Base is available without infra-red arm and comes in sizes to hold one or two 12-by-20 in.

SLIDE-OUT MOTOR AND FAN* cut your maintenance costs

Simply removing patented half-section of cone (left) allows motor-and-fan assembly to slide on rails (above) right out of DeBothezat Bifurcator for quick and easy inspection and maintenance. Bifurcator housing, originally installed as a section of the duct work, remains in place. This ease and convenience result in quick work which sharply cuts your maintenance costs.

DIRECT DRIVE CUTS COSTS, TOO

Direct drive eliminates inefficiency and maintenance problems of belts, yet motor operates in cool, clean air. Twin ducts of Bifurcator carry abnormally hot, corrosive or explosive fumes **around** motor, isolate it from destructive fumes handled by direct-drive exhaust fan. Fan wheels available from 12" to 48".

*Optional extra. Patents Pending.

Write for illustrated Bulletin DR-7-61

AMETEK

DeBOTHEZAT FANS

A DIVISION OF AMETEK, INC.

Dept. PE-1261, EAST MOLINE, ILLINOIS

Circle 612 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 158)

pans and in two heights. Combination units with heated base have thermostat and three-conductor cord. Crescent Metal Products, Inc.

For details, circle 51 on Post Card

WATER HEATERS for large volume hot water application

With a 670,000 Btu/hr input, Model 818 is reported to do the work of a 16-hp boiler and require minimum of floor space. The coil-type, gas-fired unit can be installed with a Permaglas glass-lined storage tank using company's Cer-Temp 80 recovery system. For larger applications it can be installed in multiples. A. O. Smith Corp.

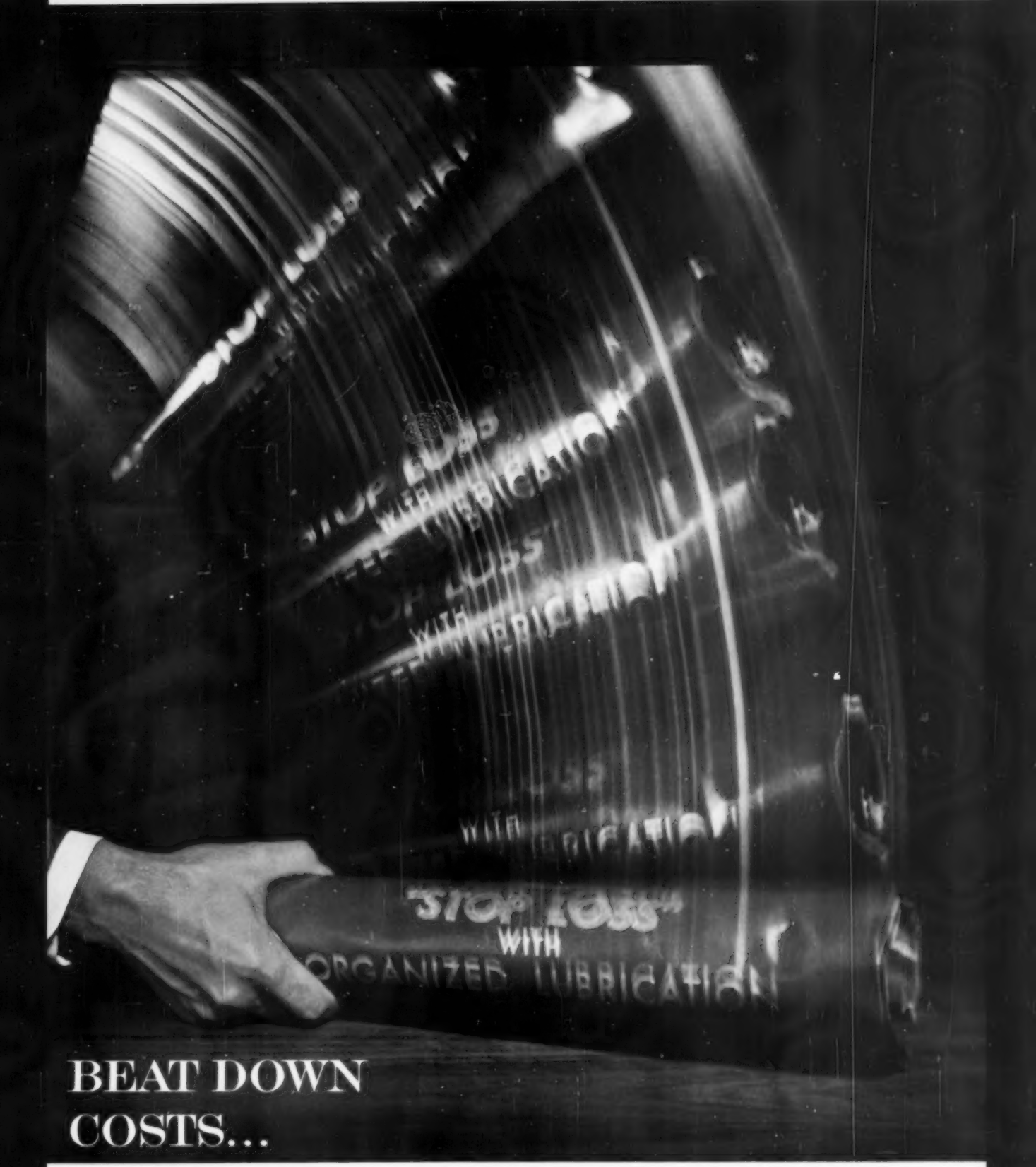
For details, circle 52 on Post Card

STATIC BATTERY CHARGER with 1 per cent regulation

Using a transistor, magnetic amplifier circuit and silicon rectifiers, this self-contained unit is designed to maintain output voltage from no load to full load within ±1 per cent of adjusted nominal voltage with ±10 per cent changes in line voltages. It is suitable

for lead-acid and nickel-cadmium batteries. Standard models have charging rates to 100 amp. Input is 115/230 v, a-c and efficiency, 75 to 80 per cent. A current-limiting circuit serves to eliminate possibility of damaging charger or battery when connected to a completely discharged battery. Equalizing charge required to balance the plates of lead-acid batteries can be applied through a manual control.

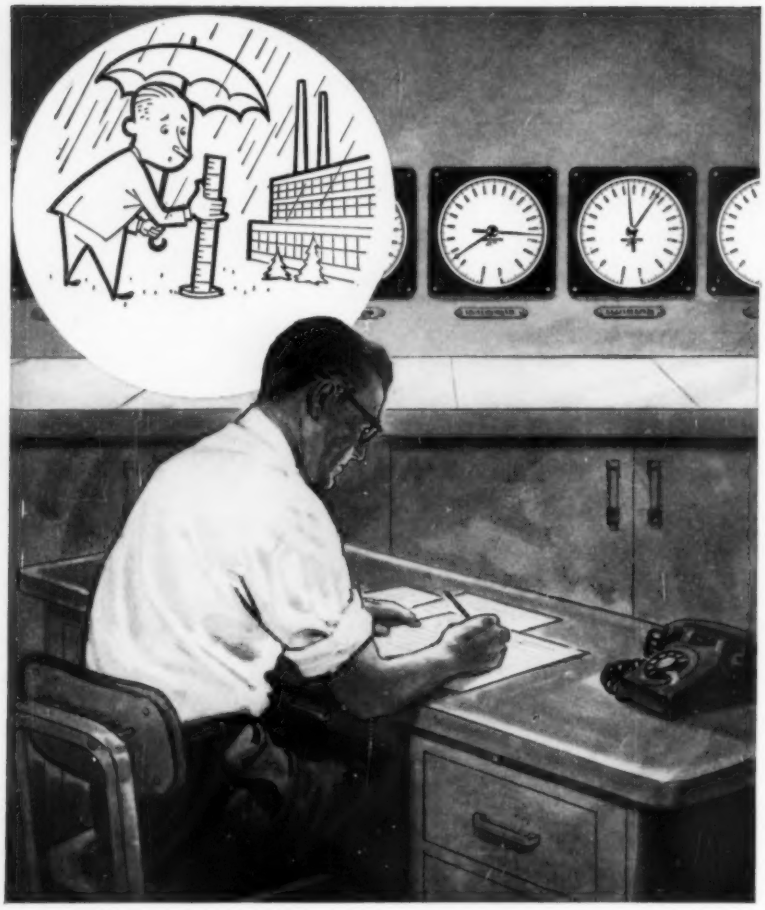
In normal operation, with battery floated across the output, the charger delivers regulated d-c power. It also maintains battery at full charge for emergency use. During overload or high demand, the battery supplements the charger while the current-limiting



BEAT DOWN COSTS...

FOR UP TO 4% MORE NET PROFIT

The Texaco man has a weapon widely used by management caught in a profit squeeze. It's Texaco's "Stop Loss" Program—a new concept of cost control through organized lubrication. Right now, this plan is helping manufacturers everywhere to save. Find out how it can help you cut your maintenance costs by as much as 15%—add as much as 4% to net profits. Write for our informative folder: "How to Starve a Scrap Pile." **TEXACO** INC., 135 East 42nd Street, New York 17, N. Y. Dept. E-210



Take the legwork out of liquid measurement

Here's practical liquid measuring—the modern way... without roaming all over the lot! Liquidometer Gauges let you inventory distantly stored liquids at a glance.

Completely automatic Liquidometer Gauges can be located as far as 250 feet from tanks. Think what this centralized system can mean in man-hours saved—let alone the additional safety of personnel who no longer have to trudge to, or tamper with, hard-to-get-at tanks.

Simple to install, and requiring no maintenance, Liquidometer Gauges measure virtually all liquids conveniently, continuously, and correctly. There's a type available for practically every liquid measuring application.

For complete details, write

LIQUIDOMETER INSTRUMENTS

THE LIQUIDOMETER CORP.

Dept. B, LONG ISLAND CITY 1, NEW YORK

Circle 614 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

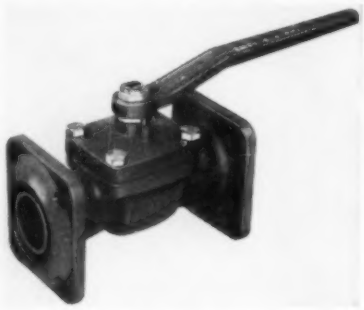
(Begins on page 158)

circuit protects it. Rectifier-Capacitor Div., Fansteel Metallurgical Corp.

For details, circle 53 on Post Card

BALL VALVE is driptight, for hazardous services

Tight closure required for handling tetraethyl lead, ammonia and other hazardous products is provided by this ball valve, featuring stainless steel ball



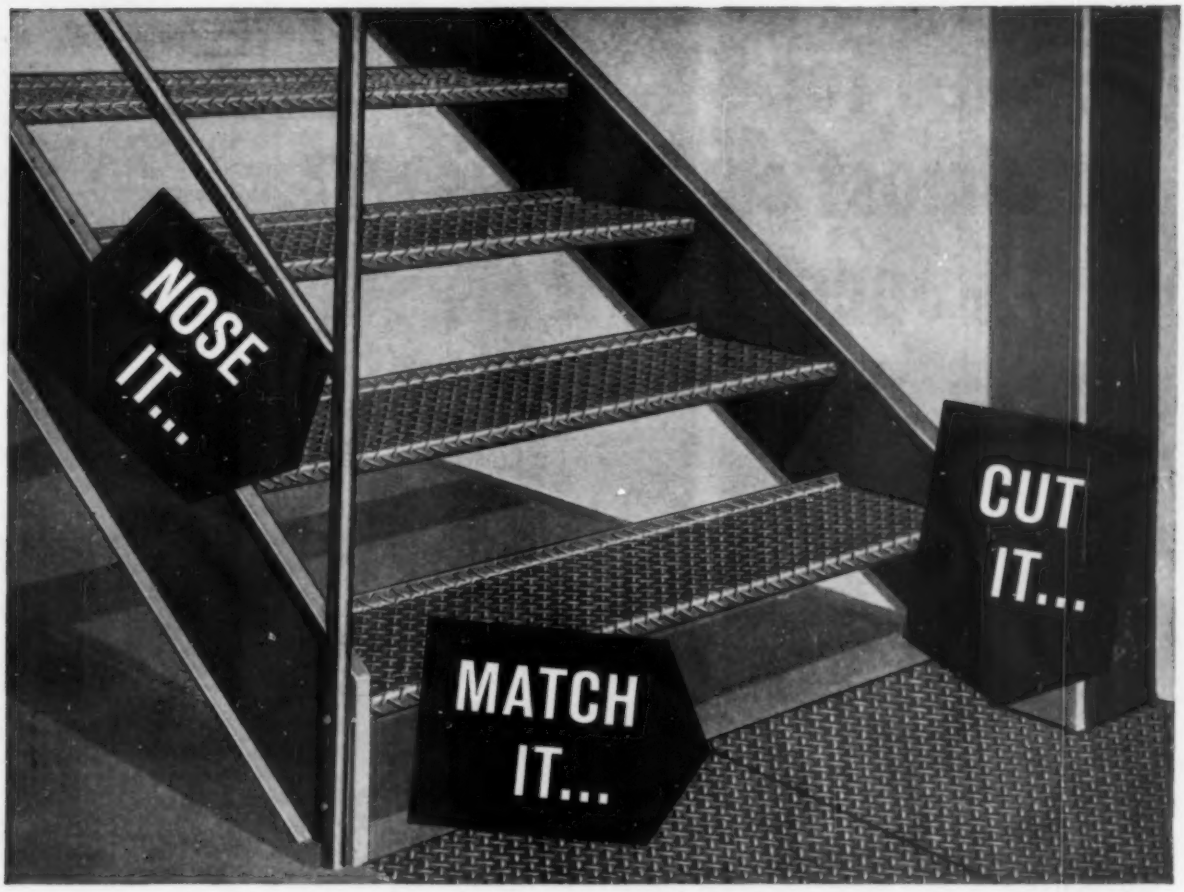
and stem, and seats and seals of Teflon. Valve is available in ductile iron, with 500 lb W.O.G. rating, tongue and groove ammonia flanges, or in steel with 300 lb A.S.A. tongue and groove flanges. Top entry permits servicing valve without removal from line. Long service, two-way shutoff, minimum pressure drop, quarter-turn operation, are other features. Automatic and remote on-off controls available. Hills-McCanna Co.

For details, circle 54 on Post Card

FAN-COIL-FILTER UNITS with installation versatility

Offering capacities of 8 through 35 tons, these evaporator-blower-filter units are designed for up-flow, down-flow or horizontal air delivery, for indoor or outdoor use. A dual circuit evaporator coil controls humidity through an inherent face and bypass handling of supply air without dampers, damper motors and controls. The two-circuit design results in lower evaporator coil temperatures and longer operating periods. This coil also offers advantages of a two-stage system. The large section and its condensing unit can operate off the first stage of a two-stage cooling thermostat while the smaller section and condensing unit are controlled by the second stage of the thermostat.

The blower section consists of twin blowers on a single shaft, powered by whatever motors and drives are needed



Alan Wood Super Diamond floor plate ...is easy to fabricate

Here's a heavy duty floor plate that can be sheared, formed, welded, and easily matched. The arrangement of the unique A. W. Super Diamond pattern allows you to bend it at any place.

A. W. Super Diamond will last for years... provides a safe, non-skid footing at all times. Easy to clean? A. W. Super Diamond can be swept, hosed or mopped easily . . . from any angle.

For easy fabrication and installation...for safety...for long wear ...specify A. W. Super Diamond. Write for Bulletin SD-S3.

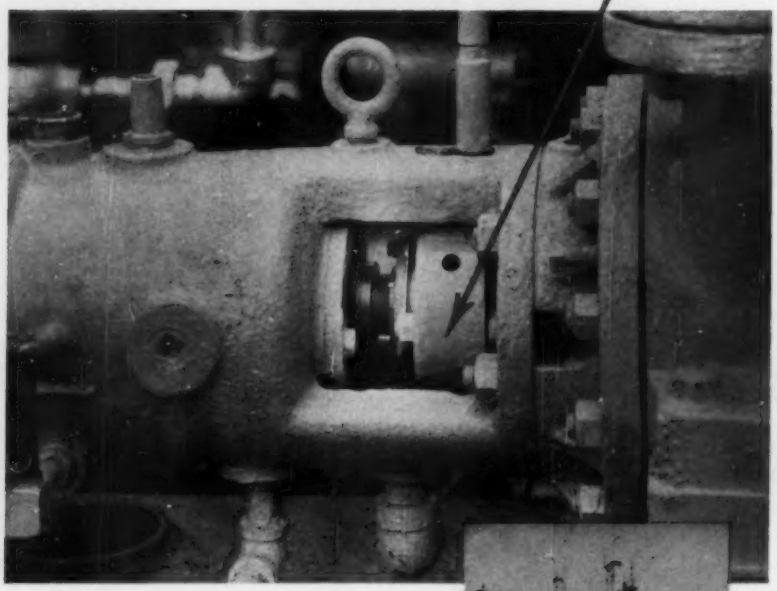
ALAN WOOD STEEL COMPANY

Conshohocken, Pa. · STEEL PRODUCERS WITH THE CUSTOMER IN MIND

DISTRICT OFFICES AND REPRESENTATIVES: Philadelphia • New York • Los Angeles • Boston • Atlanta Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver Canada: A. C. Leslie & Co., Ltd.

Circle 615 on postcard, page 33

Sealed for 8½ years of almost continuous operation!



Maintenance required —NONE!

Pumping gasoline stabilizer at a temperature of 320°F, and pressure of 300 psig, the Bel Oil Company, Elton, Louisiana, has chalked up a record of 8½ years of almost continuous, day and night service—without any kind of maintenance on this Type U Borg-Warner Mechanical Seal.

When finally taken down after this record run, only the gaskets and seal faces were replaced, and the old faces were re-lapped and returned for use as spares.

This amazing performance is not unusual for Borg-Warner Mechanical Seals. Users in all industries and for all applications report new reliability records.

Write for complete information, no obligation, of course!

Borg-Warner Mechanical Seals

B-W

DIVISION OF BORG-WARNER CORPORATION

P.O. Box 2017, Terminal Annex, Los Angeles 54, California

Circle 616 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 158)

for the requirements of the installation. Air volumes of 4000 to 15,000 cfm are available at static pressures to 1½ in. wg. The filter section connects to either flow or coil section air intake and access doors are provided at both ends. Racks accept standard 2½-in. thick throway filters. Lennox Industries Inc.

For details, circle 55 on Post Card

REVOLVING LIGHT BEAM shoos the birds away

For use in warehouses, graneries, hangers and plant storage areas, Bird Repeller flashes 200 intense alternate-color beams per minute which harass and chase away any birds around. Unit operates on 110 v, 60 cycles a-c (220 v available), has four f2.5 parabolic lenses with a 100 AX/CL bulb. It is simple to install, weather resistant, rust and corrosion proof. Tripp-Lite, Div. Trippe Mfg. Co.

For details, circle 56 on Post Card

QUICK-DRY SPRAY covers print on old cartons

Tan Box Saver comes in a pressurized can and leaves an even coating that matches carton color, permitting re-use

of boxes and cartons. A 16-oz can costs less than $1.50. Crown Industrial Products Co.

For details, circle 57 on Post Card

IMPROVED EXTINGUISHERS for Class B, C fires

Purple-K Extinguishers are claimed highly superior to conventional equipment for Class B and C (Flammable liquid and electrical) fires—twice as effective on gasoline and oil fires. Purple-K, developed by the Naval Research Laboratory, is a potassium bicarbonate base dry chemical. Although similar in consistency and appearance to sodium base dry chemical now used on Class B and C fires, it offers four

WE DON'T WANT ANY FLOATERS FOR THIS JOB!

Where it's important to maintain accurate liquid level control, it's risky to bank on a float or displacement type control when you can get one that's stable—never thrown off course by waves or surface turbulence—one that's designed simply and huskily built for year after year dependability.

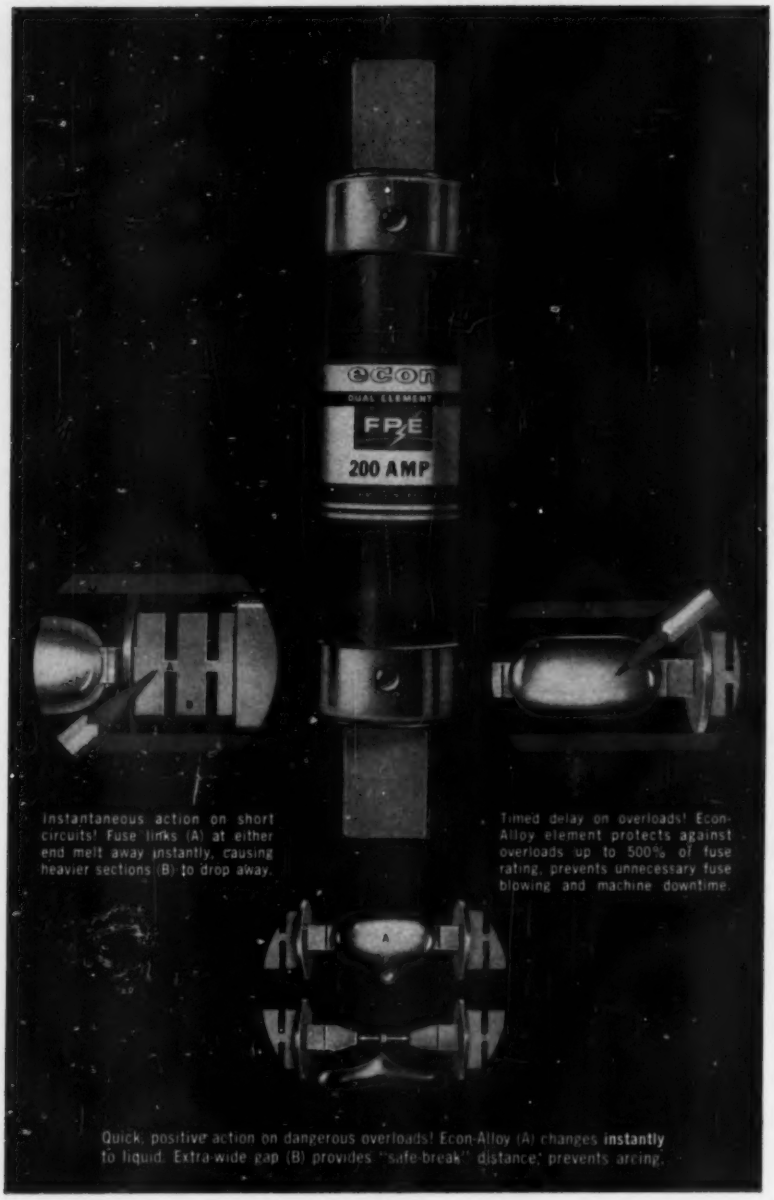
The floatless pilot is Leslie-LevelMatic.® It works by precise sensing of any variations in differential pressure. Set a single-knob-adjustable proportional band to the exact response your system requires. The level set point is just as easy to set—independently—at will.

It's likely you'll pay much less for Leslie-LevelMatic control, too. There are no expensive float cages to buy and install. Installation involves only one, or at the most two, half-inch connections to the tank. And Levelmatic's inherent stability makes the optional reset feature more the exception than the rule.

Expect *low* maintenance costs—there are no wearing parts to cause breakdowns. Write today for illustrated Bulletin 583 presenting full details.

LESLIE REGULATORS AND CONTROLLERS
A SINGLE STANDARD OF QUALITY SINCE 1900
Leslie Co., 707 Grant Avenue, Lyndhurst, New Jersey

Circle 617 on postcard, page 33


econ
DUAL ELEMENT
FPE
200 AMP
Instantaneous action on short circuits! Fuse links (A) at either end melt away instantly, causing heavier sections (B) to drop away.
Timed delay on overloads! Econ-Alloy element protects against overloads up to 500% of fuse rating, prevents unnecessary fuse blowing and machine downtime.
A
Quick, positive action on dangerous overloads! Econ-Alloy (A) changes instantly to liquid. Extra-wide gap (B) provides "safe-break" distance; prevents arcing.

it blows!

(but only when it's supposed to)

On a short circuit, an Econ® dual-element fuse blows instantly. However, on an overload it blows only when the pre-determined heat and time limits are reached—never too early, never too late! This unparalleled consistency is possible because the Econ fuse has an exclusive eutectic thermal-alloy element acting as a heat-sensing device.

Econ's eutectic alloy, laboratory controlled from production to utilization, operates on the heat created by the over-current. Result—more dependable operation, lower fuse replacement costs and reduced downtime on machinery.

What's more, ECON dual-element fuses are certified by Electrical Testing Laboratories, Inc., to interrupt in excess of 100,000 RMS amperes! ECON dual element fuses are another big reason why, when it comes to fused circuit protection, it pays to "Remember to Use Economy Fuse!"

FPE **ECONOMY FUSE DIVISION,** Des Plaines, Illinois
FEDERAL PACIFIC ELECTRIC COMPANY

FREE! Complete 12-page fuse catalog and pocket-sized fuse selector for motor protection.
Circle 618 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

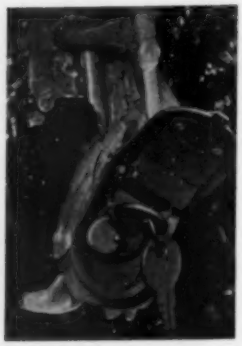
(Begins on page 158)

performance advantages: 1) Fire fighting effectiveness is substantially increased; 2) Operator technique is less critical because it does not allow fuel to reflash as easily; 3) The first application on a fire does not cause momentary hot flare-up, so the operator can approach the fire more easily; 4) It puts out the leading edge of contained flammable fires more easily. Most of this company's dry chemical extinguishers can be converted to use of Purple-K with minor modifications. Ansul Chemical Co.

For details, circle 58 on Post Card

OUTDOOR PADLOCK is ice-proof and rust-proof

For use in severest weather conditions, this padlock features housing of aluminum alloy casting and other parts of non-ferrous metals. Padlock face is



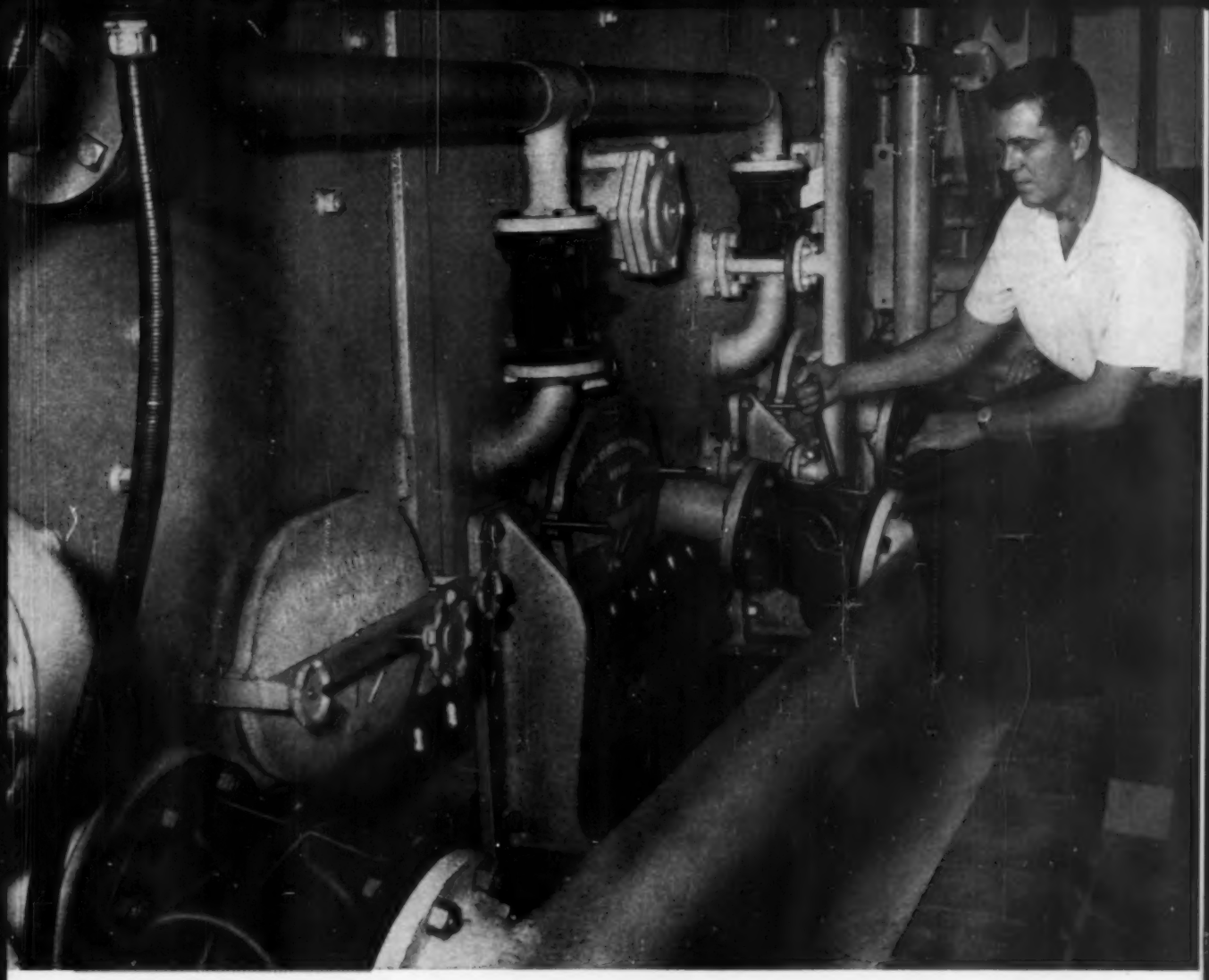
protected by lid held snugly by stainless steel flat spring. Dust cap over keyway is optional. Padlock has swing yoke which breaks through heavy ice coatings as lock is opened. Lock itself is tumbler type, available with individual keying or keyed alike. CLM Industries, McGraw-Edison Co.

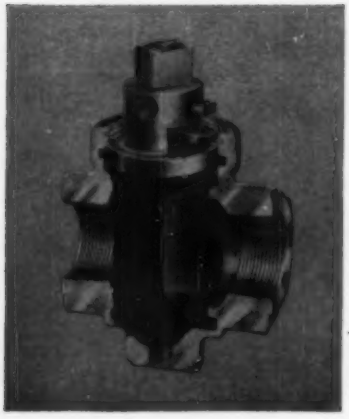
For details, circle 59 on Post Card

EXPLOSION-PROOF MOTOR, sub-fractional horsepower

This explosion-proof motor is available in single-, two- or three-phase induction or synchronous types from 1/150 to 1/20 hp, and in torque or dynamic brake types. Two-, four-, and eight-pole models give speeds of 3600, 1800 and 900 rpm. Standard mounting is flange or foot. Motor is UL-approved for operation in Class I, Group D and Class II, Groups F and G. Holtzer-Cabot Motor Div., National Pneumatic Co., Inc.

For details, circle 60 on Post Card





BROKEN GLASS AND PAPER WON'T CLOG THIS VALVE

W-K-M ACF Non-Lubricated EC Plug Valve

Many valves were tried for the tough job of controlling the flow of a caustic washing solution that often contained bits of bottle glass and labels, but W-K-M's EC Plug Valve was the only one that could do the job successfully.

We admit this is a problem you don't run into every day, but it's a good indication of the effectiveness of the W-K-M EC Plug Valve. Whatever type of service this valve is applied to it gives a tight seal that can be adjusted on the line when wear develops. Further it excels in the handling of solid bearing liquids or gases since its elastomer coated plug resists even severe abrasive action. The W-K-M EC Plug Valve requires no regular maintenance since it is non-lubricated.

Write for specification sheet AE-1061 for full details.

WHEN SO MUCH DEPENDS ON A VALVE...SPECIFY W-K-M ACF

W-K-M
DIVISION

ACF INDUSTRIES

P. O. BOX 2117 HOUSTON, TEXAS

Circle 619 on postcard, page 33

HUMIDIFY FOR PROFIT!

- Improve production, cut waste in storage, handling and processing of hygroscopic materials.
- Solve static electricity problems.
- Reduce absenteeism by improving wintertime health and comfort conditions.

For effective, economical humidification in areas heated by radiation or unit heaters

ARMSTRONG UNIT HUMIDIFIERS for Direct Discharge Into the Atmosphere

ARMSTRONG ADVANTAGES

- Moderate first cost, minimum maintenance and low operating cost.
- No odor or dampness, no dripping, no mineral dust.
- Big Capacity
- Easy installation.

Here is the proven answer to direct area humidification—Armstrong Unit Humidifiers. Installed like unit heaters in plant and office areas, they discharge clean, dry steam into the room atmosphere. Integral fans disperse the water vapor or the units may be installed in cooperation with unit heaters. Humidistat controls the humidity at the desired level. The unique separating and silencing chamber of Armstrong Unit Humidifiers assures quiet drip-free operation.

Bulletin 500-D fully describes Armstrong Unit Humidifiers and gives detailed information on how relative humidity affects your profits. Ask for a copy, today. And ask to have your Armstrong Representative survey your humidification requirements.

ARMSTRONG HUMIDIFICATION

ARMSTRONG MACHINE WORKS

9124 Maple Street • Three Rivers, Michigan

The manufacturers of Armstrong Steam Traps

114-SH

Circle 620 on postcard, page 33

NEW BOOKS

for the plant engineer

Fluid Behavior

FLUID MECHANICS by Richard H. F. Pao. Size 9¼ by 6⅛ in.; 502 pp including index; illustrated, clothbound. Published by John Wiley & Sons, Inc., 440 Park Avenue South, New York 16, N.Y. Price $7.50.

THE PLANNED purpose of this work is to serve as a textbook for introductory teaching of fluid mechanics at college level. The book can also be used as a reference for engineers whose work dictates better than passing familiarity with the subject. However, it is recommended that the mathematical background of prospective students includes at least a working knowledge of differential and integral calculus.

Physical concepts are stressed in the book which contains numerous diagrammatic illustrations. Practice problems and references for further study also appear.

A portion of the topics of the eleven chapters in the book are: fluid kinematics; fluid viscosity and flow of real fluids; fluid flow about immersed bodies; and dynamic lift.

Professional Unions

THE IMPACT OF THE PROFESSIONAL ENGINEERING UNION by R.E. Walton. Size 8¾ by 5½ in. approx; over 400 pp including index; clothbound. Published by Division of Research, Graduate School of Business Administration, Harvard University, Boston, Massachusetts. Price $5.00.

PROFESSIONAL unions were studied by the author of this book; the overall study encompassed over ten companies. Most of the engineers and scientists in the firms worked in large groups in research and developmental activities.

The text is divided into five parts; the first contains an introductory chapter and also, one dealing with historical perspective. These include comments on: methods and focus of the study, composition of bargaining units, and relationship to the labor movement.

Compensation is put under focus in the second part. The topics treated in this portion are: salary levels; premium pay and fringe benefits; salary structure; merit budget; and merit review system.

Impact on personnel administration and also the effect on the engineering

organization are discussed in the next chapters containing material on many related subjects such as layoffs, promotions to supervisory rank, forced resignations, and engineer - supervisor relations.

The last section includes comments on the effect on operational standards of management, and conditions which create a need for collective action by employees.

On Filtration

FILTRATION by George D. Dickey, P.E. Size 9¼ by 6¼ in. approx; 353 pp including index; illustrated; clothbound. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N.Y. Price $12.00.

AN INFORMATIVE treatment of solid-liquid filtration details and equipment is presented in this book. The publication includes a section on the development history of filtration and one which has a brief account of the theory of filtration and includes a few formulas.

Separate chapters deal with gravity filters; vacuum filtration; pressure filters; centrifuges and centrifugals; and filter media.

Among other chapter subjects discussed in this book are: agitation and filter cake production; conditioning, coagulation and filter aids; sewage clarification and sewage sludge dewatering; and installation and operation.

Use of the Oscilloscope

USING THE OSCILLOSCOPE IN INDUSTRIAL ELECTRONICS by R. G. Middleton and L. D. Payne. Size 8½ by 5½ in.; over 250 pp; illustrated; paperbound. Published by Howard W. Sams & Co., Inc., 1720 East 38th St., Indianapolis 6, Indiana. Price $4.95.

INFORMATION on use of oscilloscopes for tests and maintenance work appears in this book which includes background material on such equipment.

Before going into specific applications, the book presents treatments of the information capability of the oscilloscope, operating features, characteristics. These are followed by comments on types of applications and different kinds of scopes.

The specific applications pointed out in the book include thyratron and ignitron controls, saturable reactors, magnetic amplifiers, radar equipment, automotive ignition systems, and transistorized controls.

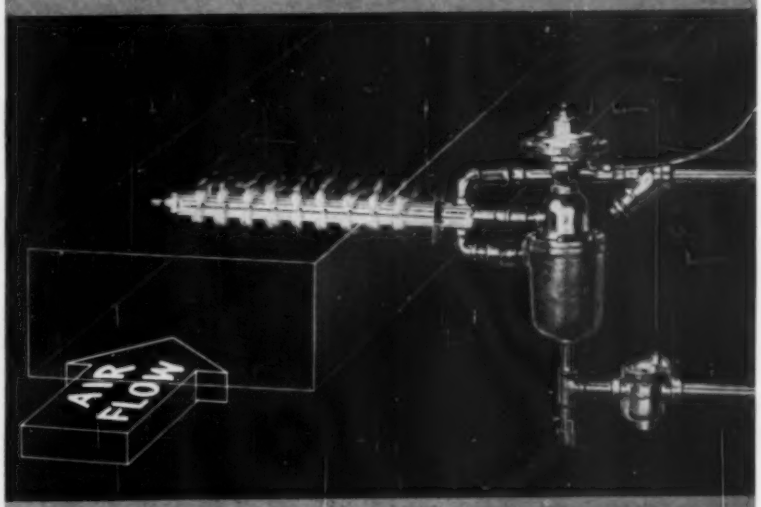
The book also contains material on photography of the scope wave form, laboratory application, and oscilloscope maintenance as well as on testing electrical entrance bushings.

A glossary of terms appears at the end of the book.

HUMIDIFY FOR HUMANS!

- Humidified air is more comfortable.
- Reduce absenteeism due to colds and respiratory ailments.
- Solve annoying, efficiency-robbing static electricity problems.

For effective, economical humidification in duct-type ventilating systems



ARMSTRONG DUCT HUMIDIFIERS with Steam Jacketed Distribution Manifolds

Here is a new answer to the most critical problem of air conditioning — the Armstrong Steam Humidifier with steam jacketed distribution manifold to provide:

1. A drip-free means of introducing water vapor to the air flow in the form of dry steam.
2. Uniform distribution of moisture across the width of the duct to avoid condensation points.
3. Accurate responsive control of the amount of water vapor introduced into the air flow.

Bulletin 504 gives complete data on Armstrong Duct Humidifiers. Ask for a copy, today. And ask to have your Armstrong Representative show you how you can profit from humidification.

ARMSTRONG ADVANTAGES

- Moderate first cost, minimum maintenance and low operating cost.
- No odor or dampness, no dripping, no mineral dust.
- Big Capacity
- Easy installation.

ARMSTRONG HUMIDIFICATION

ARMSTRONG MACHINE WORKS

9124 Maple Street • Three Rivers, Michigan

The manufacturers of Armstrong Steam Traps

115-BH

Circle 621 on postcard, page 33

Reduce Plant Maintenance Costs With Clipper Masonry and Concrete Drilling and Cutting Equipment

Use **CLIPPER CONCRETE SAWS** to saw trenches for water, gas, conduit, steam and air lines, sewers, or to repair random cracks or bad construction joints. Trenches can be made narrower and shallower with less material to remove and replace. No rough edges, no random cracking or spalling. Sawed edges resist damage under the hardest impact. Sawing is dustless—no downtime necessary, even around precision machinery, production, or food processing areas.

Use **CLIPPER CORE DRILLS** to drill holes up to 14" in diameter in minutes through reinforced concrete, marble, brick, tile, stone, refractories, or asphalt. Provides clean, dust-free holes in walls or floors of any thickness. The economical answer to such plant maintenance problems as plumbing, electrical, and air conditioning installations. Drills big holes, small holes, square holes, round holes. Any hole, any time, in reinforced concrete and masonry in minutes.

Use **CLIPPER MASONRY SAWS** to cut tile, brick, block, and stone for industrial construction, maintenance, and remodeling. Cut any material from 9" splits to refractory liners. Cut at any height from 0" to 17" and never turn off the motor. Choose from a wide range of Diamond and BLUE BOND Safety Abrasive blades for all masonry and refractory materials. Clipper blades reduce cutting costs up to 30%, good reason why 4 out of 5 buy Clipper!

CALL COLLECT (GRand 1-0766) FOR A FREE DEMONSTRATION IN YOUR PLANT

MR. CLIPPER

Clipper "SAILS RIGHT THRU"

MANUFACTURING CO.

2807 Warwick
Kansas City 8, Mo.

SOLD DIRECT FROM OFFICES AND WAREHOUSES COAST TO COAST
Factories: Australia, Brazil, England, France, Germany, Italy, U.S.A.

127X

Circle 622 on postcard, page 33

Midget Engines

(Continued from page 122)

are—even to centrifugal clutch (automatically engages when engine is revved up, drops out when engine is idled), cylinder (its inside diameter a minute 1.250 in.) and piston.

One plant advantage of the midgets: like an electric motor, they can be bolted in place . . . almost anywhere. They can belt-drive pumps, mixers, run portable conveyors and, because of their scant weight, can be readily fitted to a work harness.

Most of the more than a dozen models currently in production or soon to be available differ from one another only in their accessories (whether they come with a tank-mounted base or carry a round fuel tank) and in gearing. Example: Model P comes with a 6.921 to 1 gear ratio (governed shaft speed: 900 rpm) and a reversed position gear case . . . and mounts a round fuel tank good for about 45-minutes' running at ½ hp. Basic model A, by contrast, is designed for applications where high shaft speeds direct from the crankshaft are required, with rpm's held rigidly to specs. Thus its governed output: 6300 rpm. The power take-off shaft (standard), an extension of the crankshaft, is ½-in. dia by 1⅜ in. long—but any size or length of shaft can be furnished to order.

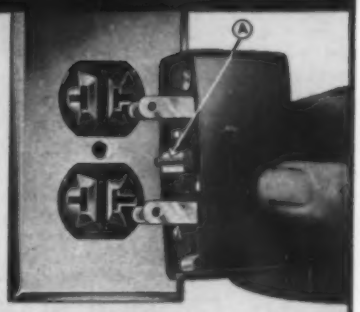
The midgets? Designed to do the job of ½-hp electric motors but do it without electrical hook-up, they're finding unique uses in plants all across the country . . . as a tool of industrial usefulness. **End**

"It's a TV monitor, Smith has a tendency to goof off."

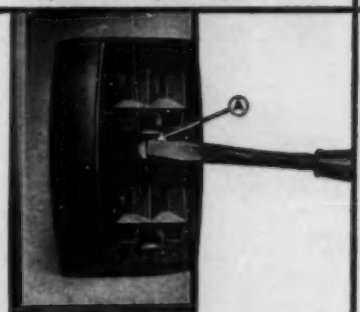
HUBBELL DUPLEX ADAPTER

15 A., 125 V.

Hubbell Duplex Adapter No. 5291 is easy to attach. Just remove screw holding metal or plastic plate to 2-wire receptacle. Leave plate in place.



Adapter plugs into 2-wire receptacle. Screw A will go through plate to grounded box. It is connected to both U-slots of adapter.



Tightening Screw A establishes adapter ground in a grounded system. If the system is ungrounded, connect adapter as shown at right.

When an existing system is not properly grounded, the adapter may be grounded by connecting a grounded wire to green hex Screw B.

FAST TEMPORARY CONVERSION TO 3-WIRE GROUNDING SAFETY

This polarized, plug-in adapter converts 2-wire duplex receptacles used with grounded or ungrounded systems to temporary 3-wire grounding receptacles. Landlords find it a great convenience when tenants requiring 3-wire facilities cannot postpone occupancy until rewiring is completed.

To make a conversion, nothing in the existing system has to be removed except receptacle cover-plate screws, to make room for a captive screw in each adapter. This captive screw acts as a conductor from the two U-slots to the grounded system. For use with receptacles in ungrounded systems, there is a green binding screw to permit connection of an independent ground wire. Either way, the electrically independent blades and contacts continue existing split circuits.

The polarized adapter operates in any parallel or T-slot duplex receptacle with metal or plastic cover plates. Brown or ivorine bakelite, for 15 amperes, 125 volts. Size: 1.4" from plate, 3.3" high, 1.75" wide.

HARVEY HUBBELL INCORPORATED
Bridgeport 2, Connecticut

Circle 623 on postcard, page 33

INDUSTRIAL FILMS

Radioisotopes In Industry

Now AVAILABLE for free loan or purchase is a new, 57-minute color motion picture, "Industrial Applications of Radioisotopes." The 16 mm, semi-technical film is a survey of the current widespread uses of radioisotopes in American industry.

The film tells the story of what the "peaceful atom" is doing for the industrial researcher, the manufacturer and the consumer. Examples of the industrial uses of isotopes for thickness, density and level gaging, radiography, and tracing were filmed at 26 sites.

For further information or location of the nearest Commission film library write: Audio-Visual Branch, Atomic Energy Commission, Washington 25.

Check Your Air System

THE PURPOSE of this 16-mm film is to encourage you to survey and re-examine the compressed air system in your plant. Stressing the need for production efficiency, the film points out that air power can perform an efficient, thus low-cost service in the oldest to the newest industries.

It offers check points to make sure that air tools are not overworked or underpowered due to leakage in the system, faulty distribution or to inadequate compressor capacity. It guides thoughts to cost reduction and contains practice-proven procedures to assure maximum system efficiency.

"Overworked and Underpowered," available through courtesy of Compressed Air & Gas Institute, has a viewing time of 23 minutes.

To request this film write to Modern Talking Pictures Service, Inc., 3 East 54th St., New York 22, N. Y.

Saw Safety With Visibility

A 15-MINUTE sound movie titled, "A New Approach to Saw Guarding," dramatizes the safety advantages of a

visual accessory tool designed for saw safety.

The guard is made of clear plastic so that the operator can "see and saw" and is so designed that it provides a fully adjustable, protected operation.

This 16-mm film may be obtained on loan and without charge by writing to the Brett-Guard Corporation, Englewood, New Jersey.

Making Sound Behave

A SOUND SLIDE film prepared by Barber-Colman Uni-Flo Distribution Division discusses important facts about air distribution sound levels. Decibel variations and air distribution sounds of different frequencies have been recorded for this interesting and educational presentation.

To arrange for a free showing write: Barber-Colman Company, 1300 Rock Street, Rockford, Illinois. A booklet telling the story, complete with pictures, is also available. For a copy request booklet F-10180.

SIX COMMON PLANT FACILITIES . . .

ONE COMMON PROBLEM . . .

. . . LICKED BY E.R.P. CATHODIC PROTECTION

The problem common to all buried or submerged metals is corrosion. Electro Rust-Proofing stops corrosion . . . stops it permanently, efficiently, economically.

E.R.P. engineers survey your protection needs and design the best system for you. Then cathodic protection takes over. Your tanks and piping, piers and towers, stay like new. E.R.P. systems eliminate downtime for repairs, cut painting and labor costs. You get sure protection. Your corrosion worries disappear.

E.R.P. is a firm of specialists in corrosion prevention. E.R.P. research for over 25 years has developed new metals, new techniques, lower costs for cathodic protection. To put them to work for you, write Dept. E.57.72.

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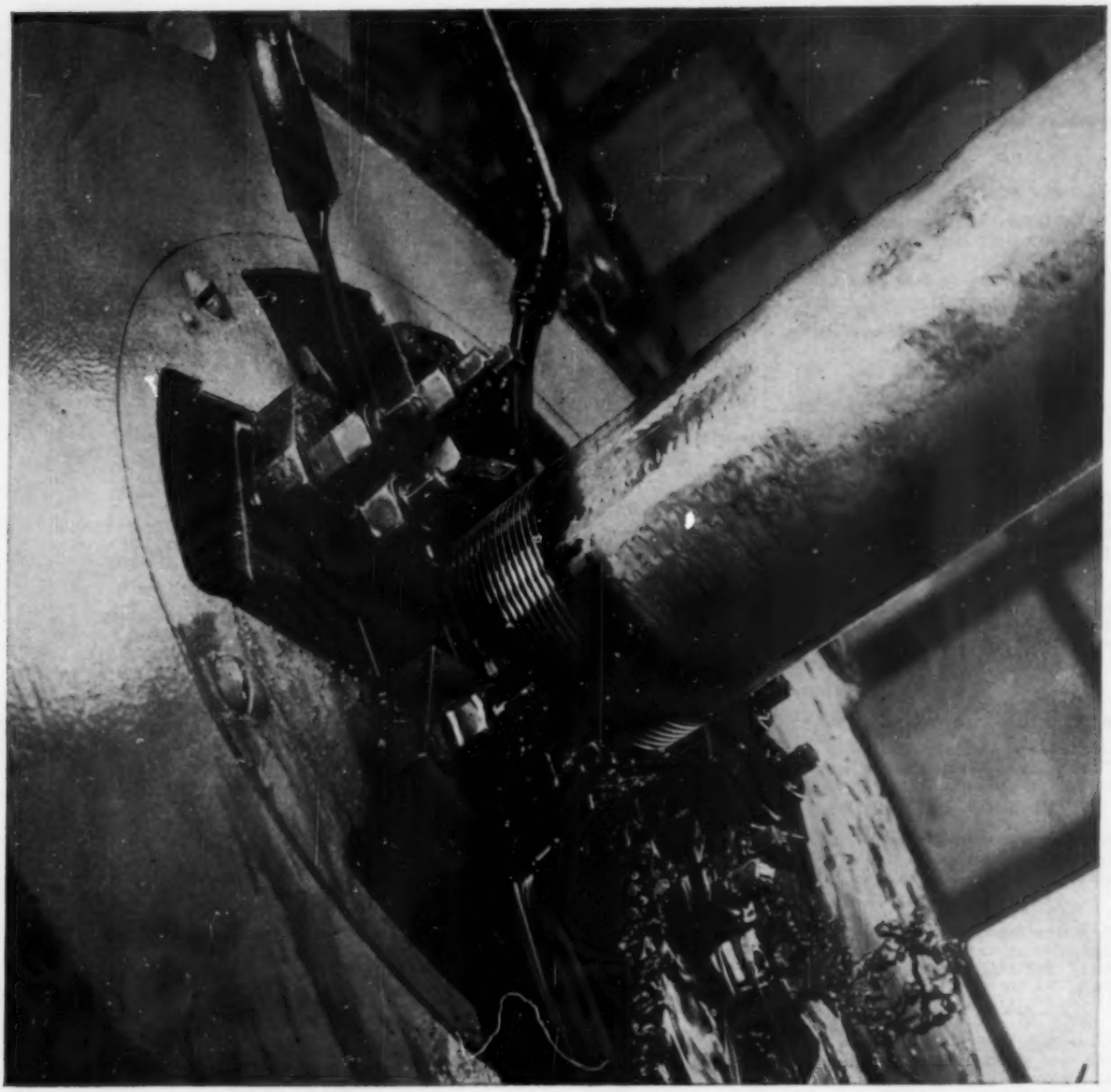
A SUBSIDIARY OF WALLACE & TIERNAN INC.
30 MAIN STREET, BELLEVILLE 9, NEW JERSEY
CABLE ADDRESSES: ELECTRO, NEWARK, N. J. • WATSAGENE, LONDON

Circle 624 on postcard, page 33



HOW TO CUT THE COST OF CUTTING!

Esso supplies a wide range of special and multi-purpose products designed to save you money on tool replacement, to boost output, and to reduce downtime...

PENNEX® cutting oils provide low tool wear in threading, tapping, and machining operations on ferrous metals. They are compounded with fatty materials for peak cutting efficiency; offer high sulfur activity for fine surface finishes.

NEBULA® EP multi-use grease serves *all* grease-lubricated parts, even those which require extreme pressure properties. Nebula EP has excellent oxidation stability, works well at high temperatures, and simplifies handling by replacing many single-purpose greases.

NUTO® high-quality hydraulic and circulating oils give effective protection against rust and oil breakdown; do a top-notch lubricating job in gear drives, bearings, and circulating systems.

Your Esso Representative can help you cut costs in many areas of your operations. Give him a call, or write us at 15 West 51st Street, New York 19, New York.

HUMBLE OIL & REFINING COMPANY

Circle 625 on postcard, page 33

AVAILABLE from Advertisers

Guide to literature offered this month in ads received by PLANT ENGINEERING before the first of last month

CONSTRUCTION

Traffic Doors—Catalog shows Rubbair doors that reduce maintenance. Stic-Klip Mfg. Co., Inc.
Circle 201 on Post Card

Ready for Erection—Details on expanded metal partitions with Quik-Erect clips. The Globe Co.
Circle 202 on Post Card

Safety Underfoot—A. W. Super Diamond safety floor plate is described in Bulletin SD-S3. Alan Wood Steel Co.
Circle 203 on Post Card

Durable Concrete Floors—Information on Masterplate aggregate for heavy-duty floors. The Master Builders Co.
Circle 204 on Post Card

For Floor Safety—Booklet tells how Multigrip floor plate helps prevent accidents. United States Steel.
Circle 205 on Post Card

MATERIALS HANDLING

Sling Safety — Tuffy handbook and Tips tell how to choose and use wire rope slings. Union Wire Rope Corp.
Circle 206 on Post Card

Sling with Built-in Safety—Facts on Sentry Sling with warning ring for overload. Campbell Chain Co.
Circle 207 on Post Card

Handling Dusty Material?—Chemical engineering catalog describes jam-safe, portable pneumatic transfer unit. Fuller Co.
Circle 208 on Post Card

Dumping Hopper—Details on a hopper that automatically dumps, rights and locks. Roura Iron Works, Inc.
Circle 209 on Post Card

PACKINGS, SEALS

Automatic Pressure-Seal — Bulletin describes Darcova Pumcups and pistons. Darling Valve & Mfg. Co.
Circle 210 on Post Card

Teflon Packing—Catalog AD-192 describes Chevron XV Teflon packing for hydraulic, pneumatic service. Garlock Inc.
Circle 211 on Post Card

Anti-Friction Packings—Catalog Ad-186 describes leather packings impregnated with molybdenum disulfide. Garlock, Inc.
Circle 212 on Post Card

Packing-Fluid Compatibility — Table helps solve hydraulic packing, or fluid, problems. E. F. Houghton & Co.
Circle 213 on Post Card

PUMPS, COMPRESSORS

Specialized Pumps — Information on selecting right unit for each application. Dorr-Oliver Inc.
Circle 214 on Post Card

Versatile Vertical Pumps — Bulletin gives details and typical application information. Johnston Pump Co.
Circle 215 on Post Card

Oil-Free Air Supply—Oil-Less bulletins describe pumps that need no lubrication. Gast Mfg. Co.
Circle 216 on Post Card

Care-Free Compressor—Facts on compact 75-hp stationary unit. Le Roi Div.
Circle 217 on Post Card

VALVES, PIPING

Stainless Steel Valve—Details on Aloyco valve's value in handling corrosives. Alloy Steel Products Co.
Circle 218 on Post Card

Chemical-Resistant Pipe—Plastic Pipe Fact-pak gives practical product information. Carlon Products Corp.
Circle 219 on Post Card

ELECTRICAL

Electrical Protection—Brochure, "Specify Silicone Insulated Motors and Save." Dow Corning Corp.
Circle 220 on Post Card

Motors with Increased Life—Facts on motors built to invisible standards of perfection. Allis-Chalmers Mfg. Co.
Circle 221 on Post Card

Modular Substation — Facts on how design saves time, space, material. Westinghouse Electric Corp.
Circle 222 on Post Card

Metal-Clad Switchgear — Details on its features, advantages. Westinghouse Electric Corp.
Circle 223 on Post Card

Switchgear Advantages — Facts on DFS drawout switch and fuse switchgear. Westinghouse Electric Corp.
Circle 224 on Post Card

Pre-Assembled Switch Racks — Details on units delivered ready to install. Killark Electric Co.
Circle 225 on Post Card

Aluminum Plug-In Duct — Bulletin SD-110 gives facts on duct with hook-swing mounting. Square D Co.
Circle 226 on Post Card

Cost-Saving Bus — Alcoa Aluminum Bus Conductor Handbook covers design, use. Rome Cable Div.
Circle 227 on Post Card

Conduit with More Wiring Space—Bulletin 2730 describes Mark 9 aluminum conduit. Crouse-Hinds Co.
Circle 228 on Post Card

Versatile Cable — Catalog S-2 describes mineral insulated cable for jobs up to 600 v. General Cable Corp.
Circle 229 on Post Card

For Lower Fuse Costs—Catalog and fuse selector on reducing replacements. Federal-Pacific Electric Co.
Circle 230 on Post Card

Long-Lasting Batteries—Facts on truck battery power package. Exide Industrial Marketing Div.
Circle 231 on Post Card

TOOLS, MACHINE SHOP

Time-Saving Tools — Catalog shows saws, tools and accessories. Porter-Cable Machine Co.
Circle 233 on Post Card

New Ideas in Power Tools—Catalog describes saws, sanders, hammers, buffers, screwdrivers. Skil Corp.
Circle 234 on Post Card

Cut Cost of Cutting—Information on Pennex cutting oils, Nebula greases and Nuto oils. Esso Standard Div.
Circle 235 on Post Card

Efficient Machine Lubrication—Grease, fluid-type lubricants detailed in "Lubriplate Data Book." Fiske Brothers Refining Co.
Circle 236 on Post Card

For Motor Maintenance—Catalog describes resurfacers, flexible abrasives, grinders etc. Ideal Industries, Inc.
Circle 237 on Post Card

FANS, BLOWERS

Easy-to-Maintain Fan—Bulletin DB-7-61 describes Bifurcator's slide-out motor and fan. De Bothezat Fan Div.
Circle 238 on Post Card

Pressure Blowers — Bulletin FI-310 describes gas-tight, rugged blowers. Buffalo Forge Co.
Circle 239 on Post Card

INSTRUMENTS

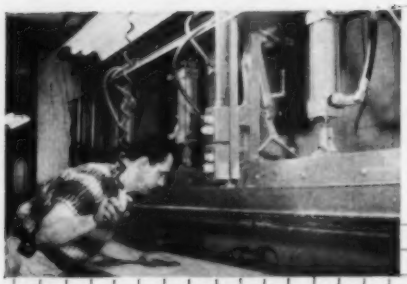
For Pressure-Flow Systems—Catalog 101 describes hydraulic-pneumatic systems. Imperial Eastman Corp.
Circle 240 on Post Card

Research Tool—Information on Strobotac tachometer. General Radio Co.
Circle 241 on Post Card

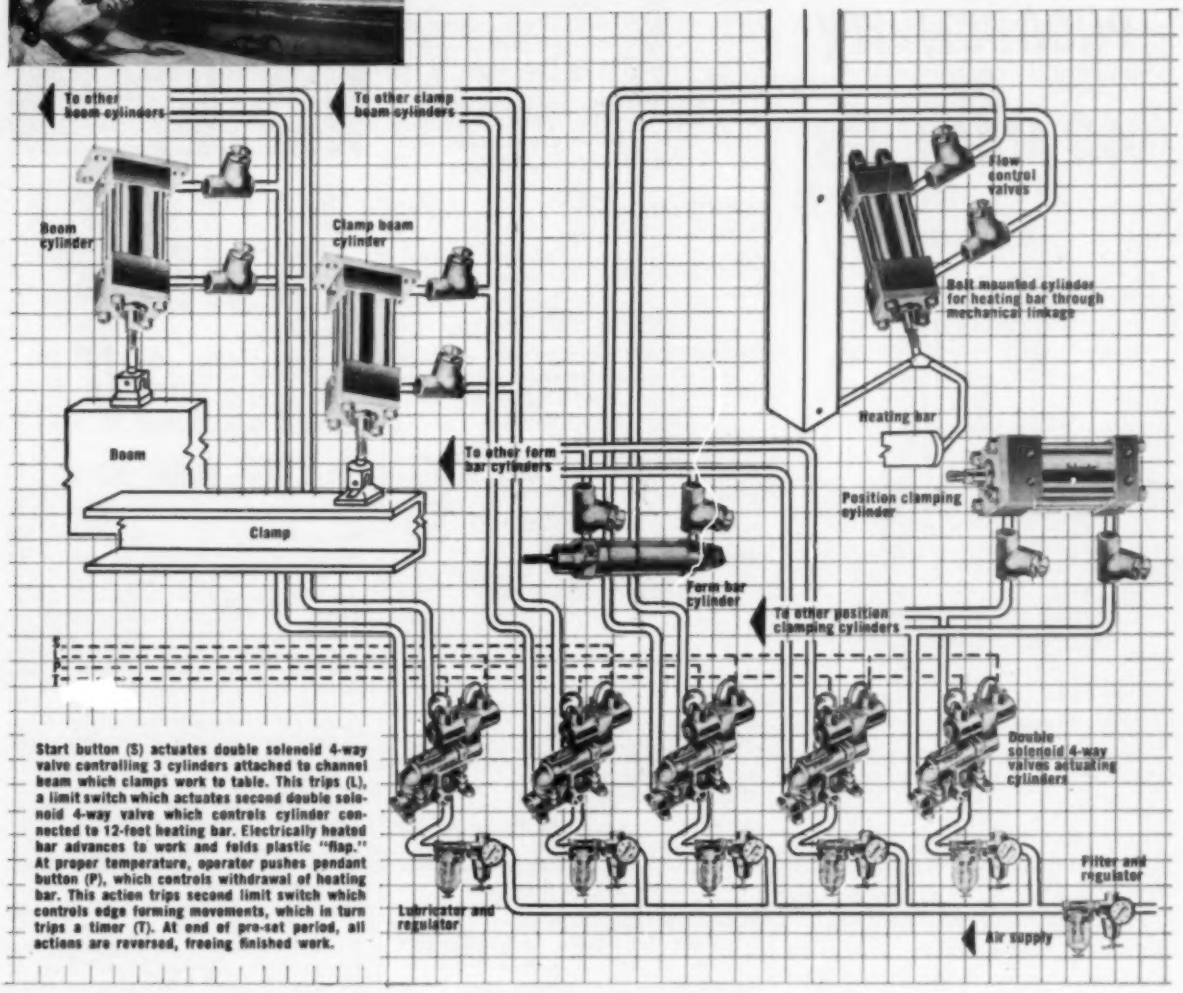
To Measure with Accuracy—Catalog 2008 describes U-tube manometers. King Engineering Corp.
Circle 242 on Post Card

Magnetic Crane Control — Bulletin 6131 tells advantages of compact

Postage-free cards for ordering literature are on pages 33-34.



There are over five dozen Schrader products in this super-productive machine! Table tops and plastic positioned and clamped, a heating bar prepares the edges for forming, and bend is made. A new top is finished every 150 seconds! George Pardonnet of Detroit's Pardonnet Manufacturing Co., who built the machine for Plastic Tops, Inc., a neighboring company in which he also has an interest, says: "Schrader Air Controls fit the application better than anything else would."


To other Boom cylinders
To other clamp beam cylinders
Boom cylinder
Clamp beam cylinder
Boom
Clamp
To other form bar cylinders
Form bar cylinder
Slow control valves
Belt mounted cylinder for heating bar through mechanical linkage
Heating bar
Position clamping cylinder
To other position clamping cylinders
Double solenoid 4-way valves actuating cylinders
Filter and regulator
Lubricator and regulator
Air supply
Start button (S) actuates double solenoid 4-way valve controlling 3 cylinders attached to channel beam which clamps work to table. This trips (L), a limit switch which actuates second double solenoid 4-way valve which controls cylinder connected to 12-foot heating bar. Electrically heated bar advances to work and folds plastic "flap." At proper temperature, operator pushes pendant button (P), which controls withdrawal of heating bar. This action trips second limit switch which controls edge forming movements, which in turn trips a timer (T). At end of pre-set period, all actions are reversed, freeing finished work.

ZIP! A COMPLEX FORMING OPERATION IS FINISHED IN 2½ MINUTES...WITH AIR

Selected Schrader Air Products—combined in a custom built machine—are forming plastic counter tops to precise specifications at this company. Problems of temperature, pressure, timing, dimension, and speed are all solved perfectly in a streamlined sequence of air control. And it's all automatic! Fantastic? Perhaps, but there's practically nothing you can't accomplish more efficiently by combining Schrader Air Products in planned air circuitry. Schrader's full lines of air cylinders, valves and accessories have the quality, stamina, and engineering simplicity you need. Follow this manufacturer's example and utilize the air you already have more fully, the Schrader way.

FULL LINE OF QUALITY AIR CIRCUIT COMPONENTS • OFF-THE-SHELF SERVICE AND INFORMATION FROM YOUR NEARBY DISTRIBUTOR • STAFFED WITH AIR CIRCUIT EXPERTS • CONSULT YELLOW PAGES OR WRITE FOR HIS ADDRESS

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484 Vanderbilt Ave., Brooklyn 38, N. Y.

QUALITY AIR CONTROL PRODUCTS

Circle 626 on postcard, page 33

NEW MANAGEMENT TOOL CHECKS PRODUCTIVITY OF 40 MACHINES

Now progressive management can have a continuous and permanent check on 40 machines or processes at a central point. With the EAI Bar Chart Recorder you can determine actual machine productivity as well as standby, inoperative, or downtime. Other information can also be recorded. ■ *EAI Bar Chart Recorders have enabled alert managements to make substantial increases in output without increasing machine investment. Evaluations of plant layout, work schedules and equipment or process effectiveness have been greatly simplified. The recorder normally pays for itself many times over in the average plant in one year.* ■ *Typical applications include scheduling of computers and data processing equipment, office machines, machine tools, commercial laundry equipment, printing equipment, piece-part processing or manufacturing operations.* ■ *Write for information today on how this recorder can assist you in reducing your operating costs.*

EAI

ELECTRONIC ASSOCIATES, INC.
Long Branch, New Jersey

Circle 627 on postcard, page 33

Type PT control. Square D Co.
Circle 243 on Post Card

HEATERS, HEATING

Direct Gas-Fired Heaters—Handbook "Industrial Uses of Direct Gas-Fired Heaters." Reznor Mfg. Co.
Circle 244 on Post Card

Spot Electric Heater—Information on Electromode Quartzone for indoors or outdoors. Electromode Div.
Circle 245 on Post Card

Versatile Heaters—Information on units that can also ventilate, supply make-up air. Lennox Industries, Inc.
Circle 246 on Post Card

MAINTENANCE

Color Survey Service—"Quick Reference Guide" plus "How to Reduce Painting Costs." Barreled Sunlight Paint Co.
Circle 247 on Post Card

Painting's Cost Cutter — Folder I-3504 describes compact, 5-gal airless sprayer. The DeVilbiss Co.
Circle 248 on Post Card

Weatherproof Plant Protection—Booklets on painting with aluminum and roof coatings. Alcoa.
Circle 249 on Post Card

STORAGE EQUIPMENT

Steel Equipment—Catalog illustrates over 1500 items—shelving, cabinets, etc. Lyon Metal Products, Inc.
Circle 250 on Post Card

Economical Shelving — Catalog describes clip-type Erectomatic shelving. Columbia-Hallowell Div.
Circle 251 on Post Card

OTHER EQUIPMENT

To Repair End-Bell Bearings—Literature, sample of Loctite sealant, the liquid shim. American Sealants Co.
Circle 252 on Post Card

Drive Tensioners—Facts on low cost tensioner for single, multiple width drives. Brewer Machine & Gear Co.
Circle 253 on Post Card

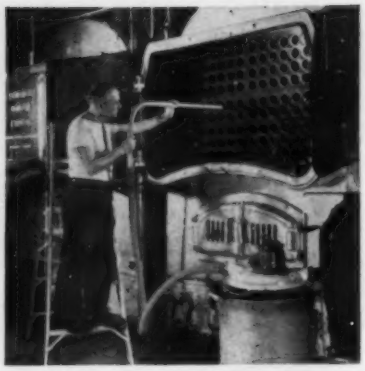
Industrial Ovens — Details are contained in the complete general catalog. Gallagher-Kaiser Corp.
Circle 254 on Post Card

Dust Collection Simplified—Brochure on Dustkop collectors. Aget Mfg. Co.
Circle 255 on Post Card

Soap Economy — "Operation Pinpoint" on skin hygiene, washroom maintenance. Sugar Beet Produce Co.
Circle 256 on Post Card

Chain Link Fencing—Data on steel fencing. The Colorado Fuel & Iron Corp.
Circle 257 on Post Card

Tough Tank Lining—Coroline bulletin describes glass-cloth reinforced lining. The Ceilcote Co., Inc.
Circle 258 on Post Card



There's a **gold mine** in YOUR Boiler Room!

Super Tube Scraper Does Fast Thorough Job

The cost-cutting potential in the average boiler room will amaze you. It can constitute the difference between overall profit and no profit.

All fuels leave a soot residue in boiler tubes. ⅛" soot means almost half the fuel is being wasted, 1/32" a 9.5% fuel loss and ¼" a 75% loss. Tube cleaning is neglected because it has been a dirty, laborious job.

CLEAN — No soot scattered in boiler room, pushed into fire box or blown on operator with Super suction boiler tube cleaning equipment.

QUICK — All soot pulled into steel drum or container for once-and-all-disposal.

EASY — Anybody can do it without muss, fuss or hard work. Makes frequent, regular cleaning feasible.

SAVE — 9.5% to 75% of your fuel bill.

Your purchase of a Super Suction Heavy Duty Cleaner Model RS-1 or BP-2 with Super boiler cleaning tools will soon pay for itself and continue to pay generous dividends in fuel savings.

You also have the finest heavy duty suction cleaning machine built today, judged by any standards. Use it for general plant cleaning and in many production operations where powerful blowing or suction is required for removing dust, chips, recovering or transferring liquids.

WRITE for this Super brochure on boiler cleaning and Super suction boiler cleaning equipment.

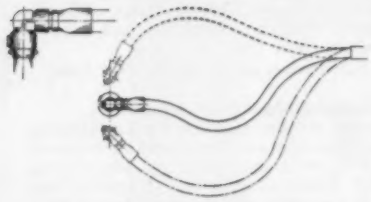
THE NATIONAL SUPER SERVICE COMPANY
1942 N. 12th St., Toledo 2, O.
In Canada:
Plant Maintenance Equipment Co.
Toronto — Montreal — Vancouver
SALES AND SERVICE IN PRINCIPAL CITIES.

SUPER SUCTION / SUPER SERVICE

Circle 638 on postcard, page 33

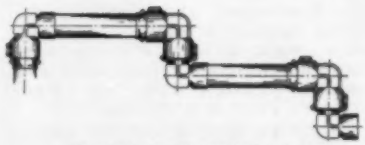
HERE ARE 3 COMMON LINE DESIGN PROBLEMS CHIKSAN SWIVEL JOINTS CAN HELP YOU SOLVE

1 **Shorten hose radii, reduce torsional stress.**



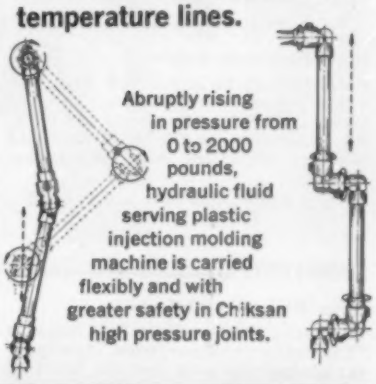
Flexible head on this lens grinder is hydraulically powered. Joints shorten required hose lengths. Hose would otherwise need suspension to keep out of way.

2 **Predetermined flex of piping between two or more points.**

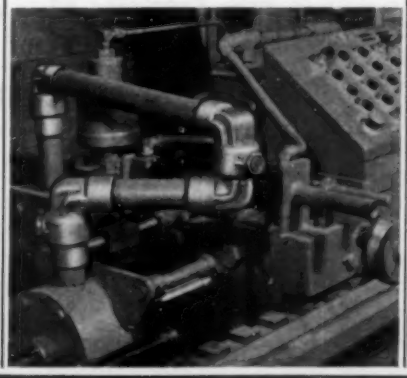


Pressure testing of pipe is nearly automatic as hydraulically driven supply heads close on pipe ends. Dog-leg jointed pipe moves back and forth continuously, safely.

3 **Achieve maximum safety of flexible high pressure, temperature lines.**



Abruptly rising in pressure from 0 to 2000 pounds, hydraulic fluid serving plastic injection molding machine is carried flexibly and with greater safety in Chiksan high pressure joints.



Studied consideration will quickly show that Chiksan swivel joints have numerous applications. Whenever you have a piping situation where movement is required, the benefits of swivel joints should be weighed. As illustrated above, Chiksan swivel joints have great versatility. They give added life and adaptability to rubber hose. They give metal lines a rubber-like flexibility. They help relieve stresses imposed by expansion, vibration or misalignment. Chiksan swivel joints, with their full 360° rotation and high service life, quickly pay for themselves by minimizing hose failures, eliminating costly line failures, fluid loss and downtime. Chiksan swivel joints have a wide range of pressure and temperature ratings to meet most industrial applications. There is a nearby experienced representative who will call, analyze your requirement and make specific recommendations. Write today for his name.

#61-64

fmc CORPORATION

CHIKSAN COMPANY • 330 NORTH BREA BLVD., BREA, CALIFORNIA

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Please send me a copy of your catalog and the name of your nearest representative.

Name_____ Company_____

Title_____ Address_____

City_____ Zone_____ State_____

CHIKSAN COMPANY—General Offices: Brea, California • Well Equipment Mfg. Corp. Division (Weco Unions, Homer Valves) • Chiksan International • Chiksan of Canada Ltd. Offices and Representatives in Principal Cities of the World

Circle 628 on postcard, page 33

BULLETINS

(Begins on page 31)

Power Packs for High Voltage

GEA 7328, 8 pp, lists features and advantages of power packs for electrostatic equipment. Cut-away photo shows construction features, with diagrams of dimensions and electrical characteristics and a specification guide included. General Electric Co.

For a copy, circle 152 on Post Card

High Dielectric Sealer

Technical Bulletin EL-65A describes a heavy duty electrical insulation material with high dielectric strength. Application method is illustrated and table of properties included. Johns-Manville.

For a copy, circle 153 on Post Card

LIGHTING

Data File on Lighting

The Light Warden Fact File contains "The Odds on Emergency Lighting," explaining the need for the lighting, with typical installation diagrams and prices included, and the "Light Warden Chargomatic," listing models, sizes, prices and battery types of emergency and exit lights and handlamps. Electric Cord Co.

For a copy, circle 154 on Post Card

Fixtures and Floodlights

Weatherproof cast aluminum fixtures, floodlights and luminaires are described in Catalog B-62, with applications, features and dimensions included. Stonco Electric Products Co.

For a copy, circle 155 on Post Card

HEATING, VENTILATING AND AIR CONDITIONING

Downflow Unit Heaters

Design and engineering specifications of downflow unit heaters are described in Catalog 765-2, 8 pp. Steam and hot water rating tables and air distribution information are included. McQuay, Inc.

For a copy, circle 156 on Post Card

Gas-Fired Unit Heaters

Bulletin A-817, 8pp, outlines design features and operating characteristics of the Series NF propeller fan type gas-fired unit heater. Application data and diagrams show suggested arrangements. American-Standard Industrial Div.

For a copy, circle 157 on Post Card

Make-up Air Heating

Bulletin AS-62, 8 pp, traces need for replacing air exhausted to remove contaminants from process equipment. Distinguishes between "make-up air heating" and "space heating," lists necessary components, data on efficiencies, concentration of combustibles. Maxon Premix Burner Co.

For a copy, circle 158 on Post Card

Central Heaters, Ventilators

Weatherproof equipment for heating, ventilating and cooling, for roof or grade mounting, is described in Advance Engineering Data Bulletin OG, 8 pp. Charts cover specifications, selection. Lennox Industries, Inc.

For a copy, circle 159 on Post Card

Elements for Heating

Electric heating elements, from straight tubulars to track switch heaters, and accessories are described in Bulletin 600. Typical applications covered. Heatrex, Inc.

For a copy, circle 160 on Post Card

Infra-Red Heaters

This small-sized, 12-pp bulletin describes Solaronics gas-fired infra-red heater, what it is, how it operates. Diagrams illustrate factual data and possible applications are listed. Southern Steel & Stove Co., Inc.

For a copy, circle 161 on Post Card

Heating Application Manual

Design and application details on infra-red heating are presented in 16-pp Bulletin PE2-61. Body heat loss tables, methods of controlling heat loss, calculating heating requirements, and table of average outdoor winter temperatures for all parts of country included. Panelbloc Div., Bettcher Mfg. Corp.

For a copy, circle 162 on Post Card

On Comfort Conditioning

This attractive 32-pp brochure, comprising a collection of "case history" ad reprints, depicts manufacturer's products at work cooling people, places, products, processes and plants. Acme Industries, Inc.

For a copy, circle 163 on Post Card

Air Handling Equipment

Bulletin 6011C, about 70 pp, is an engineering manual covering manufacturer's compact line of air handling units for cooling, heating and humidity control. Includes methods of coil selection, typical design problems and basic information on air conditioning and heating fan capacities. Dunham-Bush, Inc.

For a copy, circle 164 on Post Card

Roof Mounted Conditioners

Sixteen-pp Form 6023B describes features and advantages of RMC conditioners and accessories. Diagrams and charts show dimensions, flow, wiring and installation, with specification and engineering data tabulated. Dunham-Bush, Inc.

For a copy, circle 165 on Post Card

MECHANICAL POWER TRANSMISSION

Multi-Drive Application Manual

Form 789, 58 pp, provides information on multi-drive equipment and accessories—motors, compressors, switches, crankcase heaters, etc.—including capacity correction values and control, amperage and wiring sizing data, starting equipment hermetics, and vibration isolation and selection tables. Charts, diagrams and schematic drawings are included. Brunner Div., Dunham-Bush, Inc.

For a copy, circle 166 on Post Card

Adjustable-Speed Fluid Drive

Bulletin A-919, 12 pp, describes application and advantages of "on the shaft" Gyrol fluid drive to boiler feedwater pumps. Cross-section drawings of two designs show how they work. Layout dimensions and selection data included. American Radiator & Standard Sanitary Corp.

For a copy, circle 167 on Post Card

Gears, Roller Chains, Sprockets

Specifications and selection data on roller chains and stock sprockets are presented in 48-pp Catalog 560. Includes data on determining chain length, horsepower ratings, dimensions, weights, strengths and prices. Dalton Gear Co.

For a copy, circle 168 on Post Card

Solenoid Operated Brakes

Small, dependable brakes for holding or stopping are described in Bulletin LJ-75, including ratings, wheel data and dimensions. Cutler-Hammer Inc.

For a copy, circle 169 on Post Card

Ball Bearing Pillow Blocks

Permanently lubricated pillow blocks, flange units and take-up units, as well as porous bronze pillow blocks and babbitted pillow blocks are featured in 12-pp Bulletin 7104. Load ratings and maximum shaft speeds given. T. B. Wood's Sons Co.

For a copy, circle 170 on Post Card

INSTRUMENTS, CONTROLS

For Reliable Telemetering

Specification data bulletins describe mercury wetted-operated transmitters, pressure-actuated transmitters, and the Universal rectangular case chronoflo receiver for telemetering by time duration impulse signals. Engineering specifications, dimensional data included. B-I-F Industries Div., New York Air Brake Co.

For a copy, circle 171 on Post Card

Commercial literature reviewed on these pages can keep you posted on what's available in plant engineering equipment. To order, use the Reader Service Cards on page 33.

Sight-Flow Indicators

Plain, drip lip and flapper type sight-flow indicators, with two viewing windows and flanged or screwed connections are described in Bulletin 820. Dimensions and specifications included. Brooks Instrument Co., Inc.

For a copy, circle 172 on Post Card

Null Balance Recorders

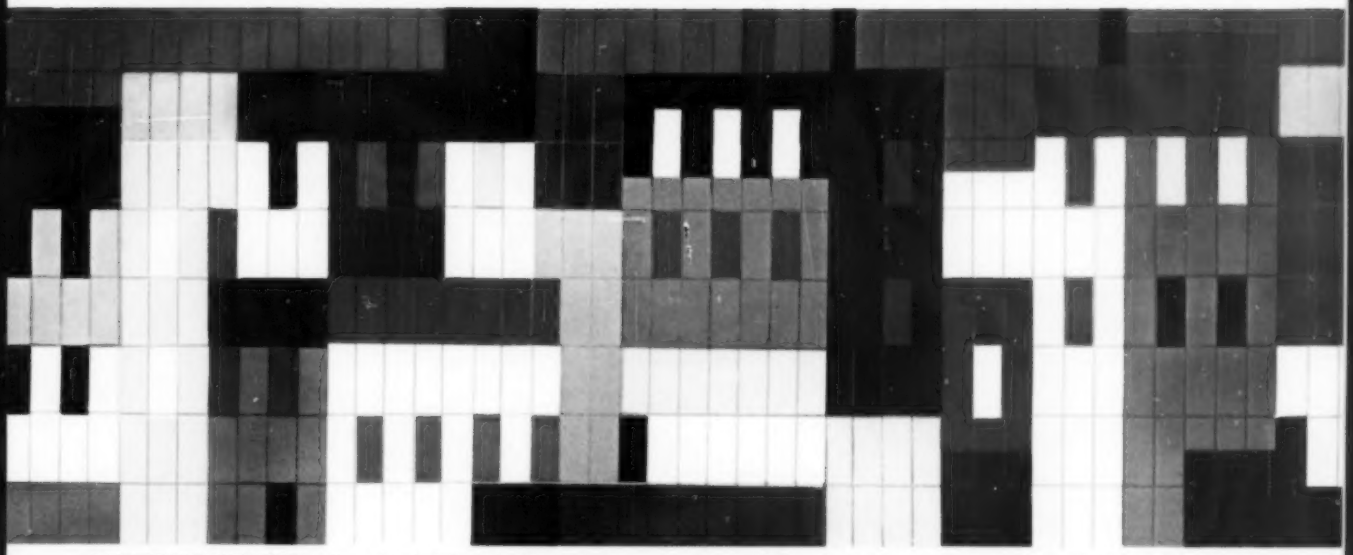
Single and multi-pen null balance recorders and recorder-controllers are described in 12-pp Bulletin GEA-6887A. Covers typical measurements performed, includes specifications. General Electric Co.

For a copy, circle 173 on Post Card

Bimetal Thermometers for Industry

Featured in 16-pp Catalog 09-100-C are bimetal thermometers for industrial and laboratory applications, as well as for alarm and control sys-

Circle 629 on postcard, page 33 ➔



"A PITTSBURGH HILLSIDE" is the subject of this colorful, symbolic mural-wall created through the imaginative use of ceramic glazed Natco Vitritile.

HOW A PITTSBURGH HILLSIDE INSPIRED A NATCO VITRITILE WALL DESIGN

When the advertising agency of Ketchum, MacLeod and Grove, Inc. recently moved its headquarters into the new Gateway Four Building in Pittsburgh, Pennsylvania, managing art director Ed Hall was given the assignment of designing the employees' canteen.

On one of the walls Mr. Hall used a colorful selection of ceramic glazed Natco Vitritile units as an "art medium" to symbolize a typical Pittsburgh scene . . . the town houses which appear to be haphazardly stacked along the city's steep hillsides.

The pleasing result of the Vitritile mural-wall is shown in the photograph above.

Ceramic glazed Natco Vitritile is a *genuine*, load-bearing clay tile product that will always retain its original "new look." Vitritile—available in 44 standard and accent colors—offers an unlimited choice of modern color combinations.

Why not use Vitritile to enhance the beauty of *your* next new building?

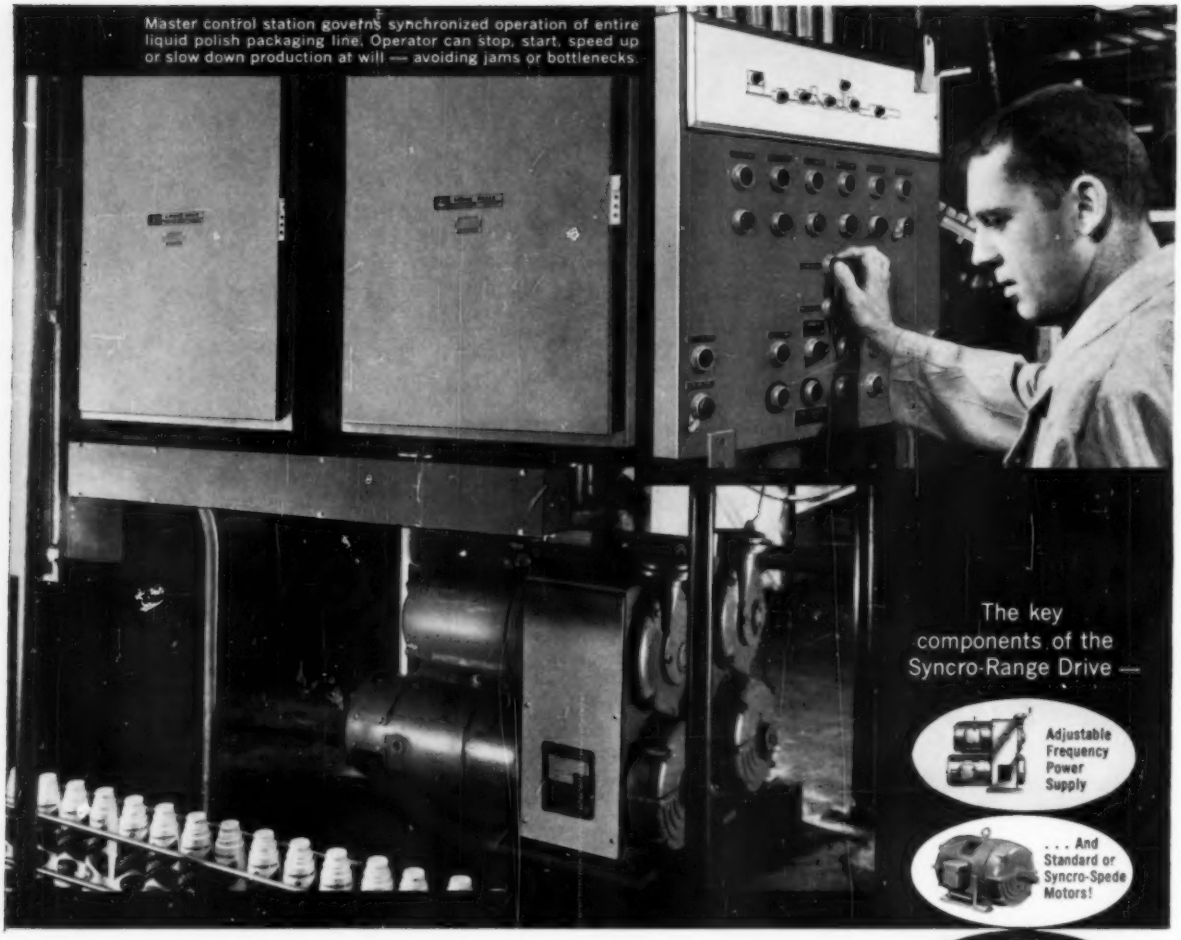
Today's idea becomes tomorrow's showplace . . . when Natco Structural clay products are in the picture

natco corporation

GENERAL OFFICES: 327 Fifth Avenue, Pittsburgh 22, Pennsylvania . . . Branch Offices: Boston • Chicago • Detroit • Houston • New York • Philadelphia • Pittsburgh • Syracuse Birmingham, Ala. • Brazil, Ind. . . . IN CANADA: Natco Clay Products Limited, Toronto

Left: Quaint, varicolored town houses stacked along a hillside is a familar Pittsburgh scene.

Right: 3¾" x 5⅛" x 11¾" ceramic-glazed Vitritile unit similar to those used in the KM&G mural-wall.


Master control station governs synchronized operation of entire liquid polish packaging line. Operator can stop, start, speed up or slow down production at will — avoiding jams or bottlenecks.
The key components of the Syncro-Range Drive —
Adjustable Frequency Power Supply
. . . And Standard or Syncro-Spede Motors!

LOUIS ALLIS SYNCRO-RANGE DRIVES automate liquid polish lines

Johnson's Wax, renowned wax and polish producer, uses Syncro-Range Drives for exact control of process lines

Controlling the speed of the precise, mass-production lines for their new, highly successful liquid shoe polish was the task Louis Allis engineers had to solve for Johnson's Wax.

The problem was to time the flow of plastic bottles, liquid polish, wool daubers, and caps into the packaging lines at precisely equal rates. Flow rate must be adjustable so the lines can be slowed down or speeded up. And the entire packaging operation must be controllable from a single master control. The Louis Allis Syncro-Range Drive solved the problem.

Syncro-Range Drive provides synchronized speed of any number of motors from a single control. It is a "packaged system" comprising an adjustable frequency power supply operating on 3 phase, 60 cycle power input . . . a group of Syncro-Spede® synchronous motors which maintain exact synchronism regardless of varying load . . . and a control which permits the speed of the entire group of motors to be simply adjusted without losing synchronization. On applications for which exact synchronism is not required, standard squirrel cage motors can be supplied.

You can readily see the advantages of the Syncro-Range Drive in systems or processes which require synchronized movement: multiple conveyors which feed consecutively; transfer lines; process lines; assembly lines requiring coordinated arrival of components; printing where one press feeds another; synthetic fibre spinning, drawing, or twisting; metal runout tables; and other similar machines which require the application of power at a number of points on the machine.

The Syncro-Range Drive is available with a choice of drive sizes to efficiently control from 2 to 200 motors. Control features are available to provide speed regulation accurate to 0.1% with 0% relative speed difference between motors! A trained Louis Allis motor application engineer is available to help. You can reach him at your local Louis Allis District Office, or by writing to The Louis Allis Company, 434 East Stewart Street, Milwaukee 1, Wisconsin.

ASD-333

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

Circle 630 on postcard, page 33

BULLETINS

(Begins on page 31)

tems, maximum-minimum indication, etc. Includes information on special applications, special windows, wells for high pressure or heavy duty installations. Weston Instruments Div., Daystrom, Inc.

For a copy, circle 174 on Post Card

Liquid Level Controls
LevelAc liquid level switches are described in 12-pp Brochure SF-765. Principles of operation and advantages are covered and a selection questionnaire included. Fulton Sylphon Div., Robertshaw-Fulton Controls Co.

For a copy, circle 175 on Post Card

Meter-Relay Applications
Operating features of locking contact meter-relays, and standard circuits for achieving popular types of control action, are described in Bulletin 5, 24 pp. Includes dimensions, sensitivities, case styles and prices. Assembly Products, Inc.

For a copy, circle 176 on Post Card

Plug-In Strip Chart Receivers
Product Data A113.3.3-2, 7 pp, describes the Series 670 Metagraphic Pneumatic Receiver, with photographs and engineering drawings supplementing discussion of construction, design, size and capabilities. The Bristol Co.

For a copy, circle 177 on Post Card

On Air Control Regulators
Application engineering data, hookup diagrams, recommended installation and steam capacity tables are included in Application Guides A5B10. Covers ways to obtain accurate steam pressure control at minimum cost with standard regulators. Spence Engineering Co., Inc.

For a copy, circle 178 on Post Card

Valve Remote Controls
Bulletin 618, 20 pp, describes flexible shafting such as valve couplings, remote operating terminals and handwheels; standard rigid reach rod controls; and gear boxes operable in any angle. Selection data covering installations to 27-in. diam handwheels included. Stow Mfg. Co.

For a copy, circle 179 on Post Card

Counters for Digital Readout
Specifications and detailed descriptions of mechanical and electrical instrument counters are included in 16-pp Catalog 400, as well as data on special applications. Includes design considerations. Durant Mfg. Co.

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COATINGS

Silicone Coatings, Finishes
Capabilities and features of high temperature resistant silicone-based finishes are described in Bulletin CDS-294, 16 pp. Illustrated with photos of comparative testing of silicone coatings and others under various conditions. Silicone Products Dept., General Electric Co.

For a copy, circle 181 on Post Card

Resin Corrosion Resistance Tests
This 16-pp report tells how three polyester resins—bisphenol A, isophthalic and general purpose—and a room temperature and heat-cured epoxy withstood immersion for up to a year in various corrosive aqueous solutions at elevated temperatures. Atlas Chemical Industries, Inc.

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WELDING, MACHINE SHOP

Standard Welding Controls
Non-synchronous resistance welding controls and high-capacity ignitron contactors and timers are described in 12-pp Bulletin GEA-6408. Illustrations and drawings show models, dimensions and applications. General Electric Co.

For a copy, circle 183 on Post Card

Non-Synchronous Controls
Bulletin GET-2683, 12 pp, gives application hints for use of resistance welding equipment, and furnishes electrical and mechanical data on components of non-synchronous welding control. Data aids in selection of proper units, determining electrical requirements and enclosure size. General Electric Co.

For a copy, circle 184 on Post Card

Air Power Presses
Complete dimensional data and specifications for open gap and column air presses in bench and floor mounting models are given in 8-pp Bulletin 0960-B1. Also describes air press components. Hannifin Co.

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Analysis of Grinding Stresses
Composed of papers published as articles, this 81-pp booklet deals with the cause, effect and control of grinding stresses. Compiled information shows that good grinding is not detrimental to fatigue strength, and may improve it. Included are 12 do's and don'ts of grinding procedure. Available to qualified plant engineers. Grinding Wheel Institute.

For a copy, circle 186 on Post Card

Water-Mix Concentrate
Characteristics and applications of a water-mix cutting and grinding lubricant for use in machining ferrous and non-ferrous materials are detailed in this product folder. Sample included. D. A. Stuart Oil Co., Ltd.

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WASTE TREATMENT

Sludge Blanket Clarifier
Operation and design of a solids contact precipitator whose agitator arms are driven by water jets at the tips is detailed in Type M Folder. Dimensions given. The Permutit Co.

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Economical Waste Treatment
Application Data Ref. 3-SIC3700.22-1, 16 pp, describes an economical and efficient solution to problem of neutralizing acid waste from pickling and plating operations. Automatic and continuous operation of the system is explained, with supply tables, flow charts, diagrams and illustrations included. B-I-F Industries Div.

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OTHER EQUIPMENT

Tanks and Pressure Vessels
This 36-pp brochure on fabrication and field erection services of custom fabricated units show behind-the-scene views of machinery, tools, techniques used in construction and erection of units. Examples of products and field-erected projects pictured. Nooter Corp.

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Brush Construction Nomenclature
"Standard Nomenclature for Construction of Industrial Brushing Tools," 14 pp, is intended to illustrate every conceivable form of brush construction for every possible industrial application. Methods of setting bristles, and component parts of brushes, are also shown and identified. M. W. Jenkins' Sons, Inc.

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Reduced Engineering Data Cost
Time and dollar savings possible with an engineering data microfilm system are described in this 8-pp brochure showing automatic retrieval and distribution of up to 3000 engineering drawings daily. Minnesota Mining & Mfg. Co.

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Industrial Gas Data
This 58-pp, pocket-sized booklet gives industrial gas data in readily-accessible form, listing physical and chemical properties of oxygen, nitrogen, argon, helium and others. Handy conversion tables provided, also charts and diagrams giving capacity data on delivery and storage systems. Air Reduction Sales Co.

For a copy, circle 193 on Post Card

Strapping Material Evaluated
This illustrated 12-pp report summarizes results of tests simulating freight hazards encountered in less than truckload shipments, showing superiority of packaging strapped with Avistrap. Industrial Packaging Dept., American Viscose Corp.

For a copy, circle 194 on Post Card

Easier Water Meter Cleaning
Service Bulletin 57B describes cleaning and reconditioning of water meters, covering various combinations of deposits such as scale and soil, scale and rust, and rust and soil. Oakite Products, Inc.

For a copy, circle 195 on Post Card

For the Process Industries
Included in 24-pp Bulletin B-8227 are cutaway views and detailed descriptions of multi-valve high-speed mechanical drive steam turbines. System flow diagrams of oil relay governors and single automatic extraction controls included. Westinghouse Electric Corp.

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DATA FILE OF LITERATURE FOR THE PLANT ENGINEER'S LIBRARY

STANDARD CATALOGS, bulletins and handbooks are described here to help plant engineers maintain a permanent data file. To order this free literature, Use Reader Service Cards provided for you on pages 33-34.

HEATING, VENTILATING

Heaters for Industrial Applications

Detailed information on electric heaters is given in 20-pp Bulletin EC-261-R. Illustrates suspension or portable and duct heaters, natural and radiant convection heaters, infra-red heaters. Electromode Div.

For a copy, circle 301 on Post Card

Industrial Heater Guide

Descriptions, technical data and application photos on combination oil/gas industrial heaters are contained in 12-pp bulletin. Performance charts, plumbing data included. Lennox Industries Inc.

For a copy, circle 302 on Post Card

Direct-Fired Gas Heaters

Industrial applications of direct-fired gas heaters are discussed in 8-pp Heating Handbook GN-200. Explains how to use heaters for general space heating. Reznor Mfg. Co.

For a copy, circle 303 on Post Card

Unit Heaters—Repair or Replace

A common-sense approach to unit heater maintenance, Bulletin 158-B helps decide whether to repair or replace unit heaters that have failed, covering causes of failure, leaks that signal failure, etc. Modine Mfg. Co.

For a copy, circle 304 on Post Card

Heating, Ventilating Equipment

Bulletin DB-7-102, 8 pp, contains ratings and specifications on direct-connected airfoil centrifugal fans, propeller and centrifugal power roof ventilators, wall-mounted and square panel propeller fans and steam, hot water electric and gas-fired unit heaters. Ilg Electric Ventilating Co.

For a copy, circle 305 on Post Card

Power Roof Ventilator

Centrifugal type power roof ventilator with weather protected housing, high efficiency and low profile design is featured in Bulletin 550-C. Clarage Fan Co.

For a copy, circle 306 on Post Card

Air Moving Equipment

Bulletin DB-45, 20 pp, contains data on roof ventilators, bifurcators, axial flow vent sets, and air jets with ratings. DeBothezat Fans Div., American Machine and Metals, Inc.

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Air Handling Equipment

Product Bulletin B-5216 describing air handling, air cleaning, air conditioning and mechanical draft equipment, including heating and ventilating equipment, industrial process and mechanical draft apparatus, others. Westinghouse Electric Corp.

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High-Pressure Blowers

Types CB and R pressure blowers designed for high pressure and moderate volume in 135 to 37,500 cfm capacities are described in Bulletin FI-310, 14-pp. Selection chart and dimension table. Buffalo Forge Co.

For a copy, circle 309 on Post Card

LUBRICATION

Organized Lubrication Benefits

Major cost control factors of organized lubrication told in this 24-pp bulletin. Covers cost control opportunities, responsibilities. Texaco, Inc.

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Lubrication Selection Factors

Recommendations for lubrication of various types of machinery and equipment are presented in Bulletin LMF-61. Lists lubricants from lightest fluid to heaviest greases. Lubriplate Div., Fiske Brothers Refining Co.

For a copy, circle 311 on Post Card

Lubricating Manual

Function and properties of lubricants and selection of lubricants for lubricated plug valves are covered in this 12-pp manual. Walworth Co.

For a copy, circle 312 on Post Card

Heavy-Duty Lithium-Base Grease

Booklet SP-9489, 8 pp, describes a heavy-duty, multi-purpose lithium-base grease for use where loads are high, shock loads may occur, and where machine element action is oscilating. Gulf Oil Corp.

For a copy, circle 313 on Post Card

VALVES, TRAPS, PIPING AND FITTINGS

Stainless Steel Valves

Catalog 59SS, 32 pp, on stainless steel valves, illustrates design and construction features. Details advantages in withstanding corrosive atmospheres. Jenkins Bros.

For a copy, circle 314 on Post Card

Non-Lubricated Plug Valves

Features of non-lubricated plug valves designed to provide tight-resilient seal and maximum resistance are detailed in Bulletin AE-1061. W-K-M Div., ACF Industries.

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Water Relief Valves

ASME-rated pressure-only relief valves are described in brochure F-ASME-1961, 8 pp. Installation diagrams, rating tables, sizes and capacities. Watt Regulator Co.

For a copy, circle 316 on Post Card

For Heat, Process Applications

Bulletin 561-C describes a diaphragm operated pressure reducing valve for steam heat and process steam applications. Leslie Co.

For a copy, circle 317 on Post Card

Pinch Valves

Construction features of Massco-Grigsby pinch valves are explained and illustrated in 14-pp Catalog 609. Provides sleeve service recommendations. Mine and Smelter Supply Co.

For a copy, circle 318 on Post Card

Jacketed Gate and Globe Valves

Technical Information Bulletin 3 details advantages of Aloyco jacketed valves for fluids that solidify or are difficult to move at room temperature. Alloy Steel Products Co., Inc.

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Valve Actuating Unit

Catalog V-200 describes the Valvmatic, a unit designed for converting hand-operated valves to automatic operation. C. H. Wheeler Mfg. Co.

For a copy, circle 320 on Post Card

Manual on Steam Traps

Catalog K, 48 pp, on steam traps, provides information on open flat and thermostatic types, pipe strainers. Discusses fundamentals of steam trapping, selection, installation: includes steam pipe sizing tables. Armstrong Machine Works.

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Steam Trap Regulators

This 12-pp condensed catalog contains technical and capacity data on steam traps, temperature regulators and heating specialties. Cutaway views included. Sarco Co., Inc.

For a copy, circle 322 on Post Card

Steam Trap Fundamentals

Facts on drainage and steam trap operation are presented in this 16-pp primer. Data on trap maintenance included. Barnes & Jones, Inc.

For a copy, circle 323 on Post Card

Pipe Dimensions Charted

This chart shows OD and wall thickness for ⅛- through 42-in. pipe. Includes information from ASA Standard B36.10 showing IPS and schedule number and their relationship. Midwest Piping Div., Crane Co.

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Rigid Plastic Pipe

Bulletin HT-100, 6 pp, describes a rigid plastic pipe for high tempera-

tures, pressures. Pictures typical applications and provides installation information. Carlon Products Corp.

For a copy, circle 325 on Post Card

Unions, Valves, Fittings

Ring-bound Catalog U-601 provides detailed literature on unions, valves and fittings of forged steel. Lists popular unions with their technical ratings. Clayton Mark & Co.

For a copy, circle 326 on Post Card

Meters, Regulators, Valves

Bulletin C-5000, 28 pp, describes gas, industrial and water meters, gas pressure regulators and valves for a wide range of services. Application tips included. Rockwell Mfg. Co.

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BOILERS, GENERATORS——

Packaged Steam Generator

Design and construction details and weights on a compact, portable shop-assembled water tube boiler with integrated firing equipment and controls are presented in 10-pp Bulletin PSG-3. Henry Vogt Machine Co.

For a copy, circle 328 on Post Card

Packaged Boilers

High temperature equipment for heating and process loads and package boilers are featured in Bulletin AD-167. Specifications, ratings included. Cleaver-Brooks Co.

For a copy, circle 329 on Post Card

PUMPS, COMPRESSORS——

Guide to Centrifugal Pumps

Installation, servicing and maintenance of centrifugal pumps is covered in 18-pp Bulletin G-2971. Information includes storage, foundation construction, alignment, piping, priming and starting, lubrication, trouble-shooting. Worthington Corp.

For a copy, circle 330 on Post Card

Vertical Pump for Industry

Cutaway view showing design and mechanical features of vertical pumps for application in sump pumps, cooling tower service, raw water supply, circulating pumps provided in Bulletin 1030. Johnston Pump Co.

For a copy, circle 331 on Post Card

For Free-Flowing to Solid Operation

Bulletin 30-C, 8-pp, outlines advantages of pumps which handle free-flowing liquids to nonpourable pastes and abrasive solids. Describes operation. Robbins & Myers, Inc.

For a copy, circle 332 on Post Card

Water-Cooled Compressors

Described in Bulletin LA-1 are the LA and LB water-cooled compressors, the LA for operation at normal plant pressures and the LB for high pressure use. Gardner-Denver Co.

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Rotary Air Products

Performance curves and engineering tables along with data on features

NOW! Clean Spills, Sumps Etc., Quicker Better...

WITH THE NEW AMERICAN Hir Vac HEAVY DUTY COMPRESSED AIR INDUSTRIAL VACUUM

The *super efficient* vacuum method—saves time, labor. No motors, cords or connections. Use continuously without maintenance. High volume suction power—lifts 55 gallons in only 55 seconds. Utilizes up to 3 inch I.D. hose for better, faster pick-up of bulk materials, liquids, heavy sludge, chips—also reclaiming of valuable "waste" materials. Vac lid assembly shifted from full to empty drums in seconds.

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Angular Drive Design

Made Possible with

AJAX Dihedral Couplings with a wide range of angular and offset capacities provide smooth running angular drives with constant peripheral speeds in minimum space. Results include compact size, improved performance, elimination of breakdowns and reduced maintenance cost. Write for performance data.

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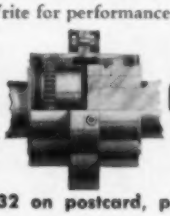

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Representatives in Principal Cities
See Yellow Pages

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DATA FILE

(Begins on page 212)

and advantages of rotary air products, including air motors, air compressors, vacuum pumps given in 12-pp Catalog 660. Gast Mfg. Corp.

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Compressed Air Fundamentals

Sixteen-pp Form 1548A on selecting a small packaged air compressor discusses compressed air and how it is compressed, single- and two-stage compressors, piston displacement, control used. Ingersoll-Rand Co.

For a copy, circle 335 on Post Card

Heavy Duty Air Compressors

Performance details and basic construction features of heavy duty air compressors for continuous operation are detailed in 36-pp Bulletin A-43. Data tables included. Joy Mfg. Co.

For a copy, circle 336 on Post Card

MECHANICAL POWER TRANSMISSION

Heavy-Duty Couplings

Catalog 70, 12-pp, contains engineering and application data on dihedral spindle shaft couplings for mills and allied equipment for metal, paper, rubber, chemical, food industries. Ajax Flexible Coupling Co., Inc.

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Anti-Friction Bearings

Catalog 424-D, 8 pp, gives capsule presentation of company's line of anti-friction bearings, describing each product. SKF Industries, Inc.

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Controlled Tensioning

Bulletin 4161 tells how use of drive tensioner eliminates shock loading through excessive chain vibration, and horsepower loss through belt slippage. Brewer Machine & Gear Co.

For a copy, circle 339 on Post Card

PACKINGS, SEALS

For Hydraulic, Pneumatic Service

Specifications and applications of rubber, rubber and fabric, leather and Teflon molded cups for hydraulic and pneumatic service are given in Bulletin AD-189. Garlock Inc.

For a copy, circle 340 on Post Card

Compression Packings

Featured in this 22-pp catalog are compression packings, including sheet and rod seal types, packing materials, and list of packings for various services. E. F. Houghton & Co.

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Mechanical Packings

Featured in 24-pp Catalog 60 are multi-purpose Bel-Vee V-ring packings, criss-cross braid packing, twisted foil packings, for oil and distillate temperatures to 1000 F. The Belmont Packing & Rubber Co.

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Piston Packing Data

Sixteen-pp Bulletin 5903 presents engineering data on Darcova Pumpcups for packing pistons of air and hydraulic cylinders, and reciprocating pumps. Darling Valve and Mfg. Co.

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ELECTRICAL

"Weatherized" Single-Phase Motors

Bulletin 470-B describes integral horsepower single-phase motors, ¾ to 20 hp, in open, protected, totally enclosed fan-cooled and explosion proof frames. Robbins & Myers, Inc.

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Distribution Transformers

Dry type distribution transformers, single and three phase, are featured in 16-pp Bulletin 5A2-BL01. Wiring diagrams provided. Acme Electric Co.

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Motor Speed Controls

Form 927B, 8 pp, features speed controls for adjustable-speed operation of d-c motors from a-c lines. Lists applications and advantages and explains operation. General Radio Co.

For a copy, circle 347 on Post Card

Reduced Voltage Starting

Automatic reduced voltage starting for low voltage squirrel cage motors is covered in 16-pp Publication 6088. Allen-Bradley Co.

For a copy, circle 348 on Post Card

Any of these bulletins, catalogs and technical booklets can be yours without cost or obligation. Use the Reader Service Cards on page 34.

Small Motor Switches

Small motor switches for small motor driven tools, heater units etc. are described in 14-pp Bulletin EA-114. Includes selection charts and mounting data. Cutler-Hammer, Inc.

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Renewable Fuses, Two Types

Bulletin 1320, 12 pp, discusses construction and application features of both ferrule and knife-blade renewable fuses, as well as renewal links to facilitate replacement. Federal Pacific Electric Co.

For a copy, circle 350 on Post Card

Electrical Equipment Digest

Presented in 168-pp Catalog Digest 143 are load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

For a copy, circle 351 on Post Card

Data on Sheathed Cables

Construction details and performance information on sheathed cables, available in steel, copper, aluminum and bronze are presented in Bulletin 1031, 16 pp. Engineering data included. Simplex Wire & Cable Co.

For a copy, circle 352 on Post Card

Safety Mineral Insulated Cable

Bulletin S-2-60, 20-pp, describes properties, applications, installation, construction and performance characteristics, and wiring specifications of mineral insulated cable for hazardous locations. Mineral Insulated Wire Div., General Cable Corp.

For a copy, circle 353 on Post Card

For Hazardous Locations

National Electrical Code articles pertaining to selection of electrical equipment for use in hazardous locations are quoted in 60-pp Bulletin 2722. Condulets are illustrated and described, wiring information included. Crouse-Hinds Co.

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Charger Efficiencies Charted

Section 57.01 illustrates the efficiencies of Exide "UR" chargers, with one chart showing models and a-c input voltage and efficiency at indicated loads, and another showing charger currents in amperes. The Electric Storage Battery Co.

For a copy, circle 355 on Post Card

Requirements of Grounding Devices

Twelve-pp Bulletin H-1998 details the evolution of grounding code and describes seven grounding types, both U-shaped devices and Twist-Lock units with related configurations. Harvey Hubbell, Inc.

For a copy, circle 356 on Post Card

Guide to Electrical Supplies

This catalog is divided into sections covering wire connectors, electricians' tools, electrical specialties, motor maintenance supplies, blowers and cleaners, wire strippers, soldering equipment. Ideal Industries, Inc.

For a copy, circle 357 on Post Card

Capacitor Guide

Featured in 26-pp Catalog C-913 are electrolytic capacitors for capacitor-start motors, and capacitors for permanent split-phase capacitor motors, capacitor-start, capacitor-run units for air conditioning. Selection tables included. Sprague Electric Co.

For a copy, circle 358 on Post Card

Aluminum Electrical Fittings

Catalog 61, 38 pp, provides data on aluminum conduit bodies, connectors, couplings, dust-tight fixtures, elbows, fixture hangers, floodlighting, switch fittings, instrument boxes, junction boxes, motor starters, panel boards, others. Killark Electric Co.

For a copy, circle 359 on Post Card

Cable Insulation D-C Tests

Effects of d-c tests and nature of d-c failures in cable insulation are discussed in Bulletin RCT 712. Curve showing leakage at test voltage included. Rome Cable Div. of Alcoa.

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For Insulator Protection

Bulletin 4-218 tells how Dow 5 compound applied to pole line insulators and electric equipment bushing protects against excessive leakage, flashovers, and service interruptions in areas where atmospheres are contaminated. Dow Corning Corp.

For a copy, circle 361 on Post Card

LIGHTING

General Purpose Floodlight

Bulletin GEA-6435C contains photometric data on general purpose floodlights for outdoor applications. Describes product features, maintenance. General Electric Co.

For a copy, circle 362 on Post Card

Industrial Fixtures

This 1961 Catalog, 24-pp, describes lighting fixtures for industrial applications. Selection tables provided. Day-Brite Lighting, Inc.

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INSTRUMENTS, CONTROLS

Automated Material Control

Bulletin GEA-7130, 8 pp, details automatic system for handling of incoming materials, work in progress or finished products distribution. Explains tie-in between material handling automation and related data processing. General Electric Co.

For a copy, circle 364 on Post Card

Mercury Bulb Elements

Bulletin 851 describes several types of mercury bulb elements. Basic principles, temperature ranges, plungers and interchangeability, element plungers covered. The Partlow Corp.

For a copy, circle 365 on Post Card

Tank Contents Gaging

Bulletin 463A describes remote and direct reading systems, including hydrostatic, hydraulic and direct reading gages with details on operation. The Liquidometer Corp.

For a copy, circle 367 on Post Card

Digital Draw-Speed Indicators

Operating details and advantages of digital draw and speed indicators for paper machines are covered in Bulletin 203-A. Specifications included. The Louis Allis Co.

For a copy, circle 368 on Post Card

PROCESSING, FINISHING

For Industrial Processing

Illustrated and described in this 20-pp bulletin are ovens, parts washers and phosphatizing machinery, dust and fume collectors and spray booths. Gallagher-Kaiser Corp.

For a copy, circle 369 on Post Card

Finishing, Processing Equipment

Industrial Equipment Catalog A-661 covers metal cleaning, surface preparation, pickling or rust-proofing equipment; spray booths; drying.

More heat with less coal... cleanup costs cut 75% with

Users report actual proof that OXI Crystals have cut coal costs substantially, reduced firebox and boiler cleanup costs up to 75%! **OXI Crystals increase boiler efficiency** by getting rid of slag, firescale, encrusted carbon and soot *fast*. OXI oxidizes combustible deposits from firedoor to stack top. Get more heat and steam at less cost . . . write for complete information today! No obligation, of course.

Also ask about ***KOR****—world's most powerful fuel oil additive, and* ***SURFBLOW****—the floating boiler water skimmer.*

OXI CORPORATION 710 Box 485, Gary, Indiana

Circle 633 on postcard, page 33

For corrosive service

THE MOST SUCCESSFUL VALVE IDEA IN YEARS!

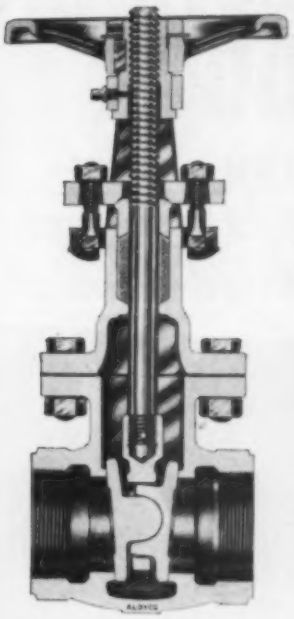

Fig. 110

This Aloyco Valve design was the pioneer! It's also the most imitated valve design in years. It met with immediate success in the chemical and petroleum fields and has found constantly growing acceptance throughout the processing industry for over a quarter of a century. Valve Fig. 110 (screwed), Fig. 116 (butt welding), Fig. 114 (socket welding), Fig. 111 (flanged) feature double disc ball and socket wedges with free floating, self-adjusting disc position which insures tight closure. For more information about the *lasting* value of Aloyco Stainless Steel Valves in the handling of corrosive fluids—write today. Ask about the extraordinary range of alloys available to solve your particular problem. Alloy Steel Products Company, 1308 West Elizabeth Avenue, Linden, New Jersey.

1-8

Subsidiary of

Longer Lasting ALOYCO VALVES

ALLOY STEEL PRODUCTS COMPANY

Circle 634 on postcard, page 33

IF YOU HAVE A LOADING DOCK

you'll want this **free** *fact filled booklet*

"FACTS, FIGURES, IDEAS on Loading Docks" operation gives specific information on: • General Design Standards for Dock and Terminals • Methods of Bridging the Gap between Dock and Truck • Methods of Dock Pit Construction • Weight and Size Restriction by States for Trucks and Trailers • Unit Loading • Comparison of Unloading Time • Selecting the Right Size Ramp • as well as many other ideas on Loading Docks you can use in your daily operations.

AMERICAN DOCKBRIDGE, INC.

Please send me your FREE Facts, Figures, Ideas booklet.

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Company

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City Zone State

233 West Oklahoma Ave., Milwaukee 7, Wis.

IN SWEET'S 23a/Am

Circle 635 on postcard, page 33

DATA FILE

(Begins on page 212)

baking and processing ovens; control components; dust and fume-control equipment. The R. C. Mahon Co.

For a copy, circle 370 on Post Card

Finishing Equipment

Contained in this file folder is a series of product bulletins on manual and automatic finishing equipment including spray guns, nozzles, pumps, tanks, heaters, air compressors, regulators, hose. The De Vilbiss Co.

For a copy, circle 371 on Post Card

CONSTRUCTION

Steel for Structures, Equipment

"New Concepts in Steel Design and Engineering," 60 pp, describes and compares types that make up the modern family of constructional steels. Illustrations of actual designs and concepts show how these steels can be used. U. S. Steel Corp.

For a copy, circle 372 on Post Card

Welded Wire Fabric

Stranded styles of welded wire fabric used for prestressed concrete construction are described in Folder WWR-806. Includes detailed specifications for welded wire fabric and cold-drawn steel wire. The Colorado Fuel and Iron Corp.

For a copy, circle 373 on Post Card

Why Insulating Firebrick

Light weight, strength, high insulating properties and other advantages of insulating firebrick are stressed in 36-pp Bulletin R-38. Also provides application and selection data and illustrates use in various industries. Refractories Div., The Babcock & Wilcox Co.

For a copy, circle 374 on Post Card

Structural Clay Products

Descriptive information and construction details on structural clay building materials are given in 24-pp Catalog S-61. Characteristics and advantages of facing tile, bricks, other products, are detailed. Natco Corp.

For a copy, circle 375 on Post Card

Good Grouting Methods

Text and photos in 8-pp Bulletin EPMG-2 explains proper methods for grouting types of heavy industrial equipment. Non-shrink Embeco premixed grout is used to explain techniques. Master Builders Co.

For a copy, circle 376 on Post Card

Modular Building Components

Design and construction advantages are detailed in this 24-pp color illustrated booklet. Describes structural frame and steel roof deck, and exterior and interior panels and door elevations; includes color samples, sectional diagrams. American Bridge Div., United States Steel Corp.

For a copy, circle 377 on Post Card

Basic-Roofing Information

"What You Should Know About Your Roof" is a 40-pp booklet telling what makes a roof fail, how to recognize roof deterioration and what to do to keep a roof in good condition. Johns-Manville Corp.

For a copy, circle 378 on Post Card

Non-Slip Steel Flooring

Algrip, an abrasive rolled steel floor plate described as a non-slip even on steep inclines, is the subject of 8-pp Booklet AL-29. Alan Wood Steel Co.

For a copy, circle 379 on Post Card

Safety Floor Plate

Advantages of Multigrip floor plate designed for sure footing and positive traction are detailed in Bulletin ADUCO-17002. Tables list sizes, weights and loads. U. S. Steel Corp.

For a copy, circle 380 on Post Card

CLASSIFIED ADVERTISING

HELP WANTED

ENGINEERS

PLANT and SENIOR ENGINEERS

A large non-defense, aggressive, expanding and stable firm needs capable and successful engineers for

CALIFORNIA LOCATIONS

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Candidates must meet the following requirements.

1. BS in engineering.
2. At least 5 years of broad experience in plant or equipment application engineering in a processing or allied industry.
3. Fields of engineering experience desirable are pumping, conveying, material handling, piping, steam, electrical and instrumentation.
4. Under 42 years of age.
5. Supervisory experience is desirable.

This firm pays very competitive salaries and offers unusual opportunity for professional growth.

Please send complete resume, giving salary requirements and background, including age, to BOX 2904, Plant Engineering, 308 East James Street, Barrington, Illinois.

All replies will be kept strictly confidential.

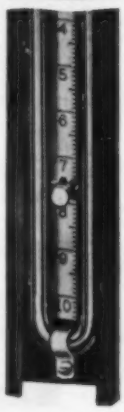
King MANOMETERS for Plant and Lab

Measure PRESSURE, VACUUM and FLOW with UNFAILING ACCURACY - - at MINIMUM COST

The liquid-filled U-tube is unequaled in simplicity and inherent accuracy. It's the *primary standard* for measuring pressure, and for checking pressure gauges.

All King Manometers, regardless of configuration, are *U-tube instruments*, with no mechanical moving parts. They give unfailingly accurate measurements in plant or lab - - permit exact duplication of pressure or flow conditions.

King Manometers are inexpensive; easy to install; require minimum maintenance. Available in the following types, for every service:



U-Type Manometers
Single Cleanout; Double Cleanout; with 3-Valve Manifold; Inverted U.

Well-Type Manometers
Low-Well; Raised-Well; Adjustable-Well; Barometric; Instrument Test; Flowmeter.

Inclined-Tube Manometers
General-Utility; High-Precision; Draft Gauges.

Multi-Tube Manometers
Individual-Well; Common-Well with fixed and adjustable wells; Photo-Manometers.

FEATURES Include—
- Wide choice of range (6" thru 130"), scales, liquids, mountings, materials.
- Easy cleanout.
- Full line of accessories.

MANOMETER CATALOG 2008
explains basic principles; simplifies manometer selection; shows complete line of manometers, accessories and indicating liquids. Write for it.

KING ENGINEERING CORP.
3231 S. State St. Ann Arbor, Mich.
LIQUID LEVEL GAGES, MANOMETERS, ACCESSORIES - SINCE 1937

Circle 636 on postcard, page 33

Safety Grating for Industry
Steel, aluminum and stainless steel grating is featured in Catalog 5911, 24 pp. Shows installation and erection. The Globe Co.

For a copy, circle 381 on Post Card

Aluminum Stair Treads, Grating
Details on aluminum stair treads and grating featuring one-piece construction are presented in Bulletin AD-679. Aluminum Co. of America.

For a copy, circle 382 on Post Card

WIRE ROPE, CHAINS

Use and Abuse of Wire Rope
Correct use of wire rope, and abuses that shorten wire rope life, are illustrated with cartoon caricatures in this 28-pp handbook. Information on rope and slings included. Union Wire Rope Corp.

For a copy, circle 383 on Post Card

Chain Overload Warning Ring
Described in this product folder is a coupling link for use between master link and chain leg which elongates and gives visual evidence that sling is overloaded. Campbell Chain Co.

For a copy, circle 384 on Post Card

Industrial Wire Rope Requirements
Wire rope recommendations for equipment used by industry are listed in Bulletin 107. Gives constructions for specific types of equipment and jobs. Leschen Wire Rope Div., H. K. Porter Co., Inc.

For a copy, circle 385 on Post Card

On Conveyor Chain Selection
This 38-pp engineering reference book contains information on selection, installation and maintenance of chain for conveying and elevating. Comparison tables, trouble shooting charts. Moline Malleable Iron Co.

For a copy, circle 386 on Post Card

MAINTENANCE

Corrosion-Proofing for Industry
Bulletin 1-2 describes corrosion-proofing materials and services, including linings, coatings, flooring, acid-proof brick, reinforced plastic processing and ventilating equipment, cements, grout etc. The Ceilcote Co.

For a copy, circle 387 on Post Card

To Reduce Painting Costs
This 12-pp booklet is designed to help reduce painting cost by accurate cost analysis. Tells why "cost per gallon" is unreliable, a formula for price comparison, how to estimate labor savings. Barreled Sunlight Paint Co.

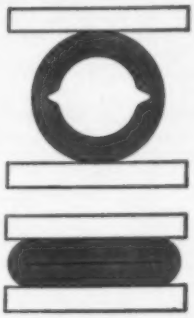
For a copy, circle 388 on Post Card

Sealant for Maintenance Use
Featured in Form 209a is a liquid sealant designed to stop equipment breakdown due to loose nuts and bolts, as well as repair loose-fitting bearings, and seal threaded or tube joints. American Sealants Co.

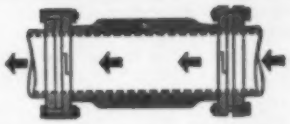
For a copy, circle 389 on Post Card

Massco-Grigsby PINCH VALVES

"Hinged" sleeve permits tight closing reduces wear.

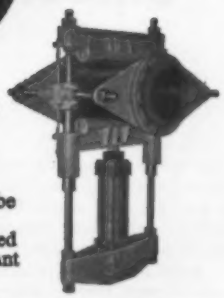


Recesses in sleeve serve as "hinges" during compression.



Unobstructed flow eliminates high friction loss; and there are no metal parts in contact with pulp or liquid.

Several types of closing mechanisms are available, from handwheel to motorized.



Automated Systems.
Completely automatic systems may be coordinated and interlocked with other plant equipment.

1" to 14" I.D.; pressures to 150 psi; temperatures to 200° F.

WRITE FOR CATALOG 609

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3800 RACE STREET • DENVER, COLORADO
OFFICES AND AGENTS IN PRINCIPAL CITIES

Circle 637 on postcard, page 33

DATA FILE

(Begins on page 212)

Vacuum Cleaning Equipment
Suction cleaning equipment for wet and dry dust and dirt removal is featured in a series of product bulletins. The National Super Service Co.
For a copy, circle 390 on Post Card

Elevator Maintenance Guide
How proper care safeguards elevator service and prevents costly repairs is the subject covered in this 24-pp booklet. Gives program for protecting elevators at economical cost. Otis Elevator Co.
For a copy, circle 391 on Post Card

Steam Cleaners, Cleaning Systems
Steam cleaners and hydraulic pressure combination cleaning systems are described and illustrated in 12-pp catalog. Detailed specifications given. Malsbary Mfg. Co.
For a copy, circle 392 on Post Card

STORAGE, SHOP EQUIPMENT

Storage Racks
Bulletin R-400, 12 pp, illustrates and describes a variety of storage racks. Application drawings, photos included. Chicago Tramrail Corp.
For a copy, circle 394 on Post Card

Shelving and Equipment Guide
To assist plant engineers in selecting proper shelving for all storage requirements, 64-pp Catalog 30 offers suggestions for correct shelving and storing materials, loose and packed parts. Instructions for planning a stockroom. Royal Metal Mfg. Co.
For a copy, circle 395 on Post Card

Reader Service Cards for ordering catalogs are on pages 33 and 34.

Steel Equipment Selection
Catalog 100 K contains 100-pp of detailed information on steel cabinets, folding chairs, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, bins. Lyon Metal Products, Inc.
For a copy, circle 396 on Post Card

Steel Shelving and Equipment
Illustrated in 8-pp Form 2715 is quick-erection, adjustable steel shelving for maximum space savings, as well as tool stands, benches, cabinets. Standard Pressed Steel Co.
For a copy, circle 397 on Post Card

TOOLS, WELDING AND MACHINE SHOP

Pipe Tool Guide
Application data on Ridgid pipe tools is provided in 16-pp Catalog 7596R-6. Wrenches, cutters, threaders, reamers, vises shown. The Ridge Tool Co.
For a copy, circle 398 on Post Card

Air Tools at Work
The growing use of air tools in building and industry is covered in 8-pp Bulletin AT-116B. Selection data and a trouble chart are included. Le Roi Div., Westinghouse Air Brake Co.
For a copy, circle 399 on Post Card

Electric Tool Guide
Portable electric tools and kits, including saws, sanders, drills, planes, routers, shapers, hammers, grinders and combination tools are illustrated in 30-pp Catalog 108. Prices given. Porter-Cable Machine Co.
For a copy, circle 400 on Post Card

Do's and Don'ts of Concrete Sawing
This brochure on concrete sawing helps reduce cost and increase life of a saw rig, and diamond and abrasive blades. Covers equipment and blade selection, operation, maintenance. Clipper Mfg. Co.
For a copy, circle 401 on Post Card

Guide to Power Tools
Presented in this 68-pp catalog are electric and pneumatic tools for production, maintenance, construction, wood and metal working. Features worm drive and high speed saws; reciprocating saws; jig saws; hammers; planes, routers; sanders; drills; drivers; wrenches. Skil Corp.
For a copy, circle 402 on Post Card

this **UNIPAK®** can **TAKE THE LOAD OFF TIRED CIRCUITS**

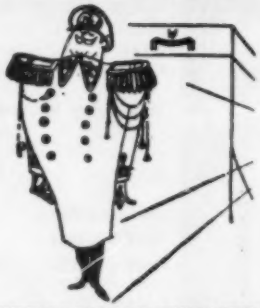
It's no secret. It's one of Sprague Electric's power factor correction capacitors — proved in engineering principle . . . made by the world's largest capacitor manufacturer . . . listed by Underwriters' Laboratories . . . used by leading manufacturers the world over. Here's why—

Motors and similar equipment in your plant use both kilowatts (working current) and kilovars (magnetizing current). The kilowatts you buy from your electric company. The kilovars you can best supply yourself with Sprague power factor correction capacitors. And the more you supply, the greater your useful power, the less the load on present wiring; the lower your electric bill.

You can get a free estimate of potential savings in your plant, or literature giving more details by writing Sprague Electric Co., 487 Marshall Street, North Adams, Massachusetts. In Canada, write John R. Tilton Ltd., 51 McCormack St., Toronto 9, Ont.

SPRAGUE®
world's largest capacitor manufacturer

Circle 639 on postcard, page 33



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Salon-size rooms • Terraces • New appointments, newly decorated • New 21" color TV • FM radio • New controlled air conditioning • New extension phones in bathroom • New private cocktail bar • Choice East Side, midtown area • A new concept of service. Prompt, pleasant, unobtrusive.

Single $15 to $22 Suites to $60
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OVENS FOR INDUSTRY
• INDUSTRIAL FUME & DUST REMOVAL SYSTEMS
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Batch-type recirculating gas fired oven

Designers, Builders and Installers of Ovens to handle any industrial process, and built to the exact specifications determined by our complete engineering analysis of your job requirements.

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Circle 641 on postcard, page 33

STANDARD MODELS

For Custom Dust Collection

A full range of job-tailored, standard DUSTKOPS — to serve single or multiple machine installations — is ready to answer your individual collection problem. Whether you're engaged in manufacturing, processing, converting or packaging, if air-borne particles are a factor, Aget has the answer — *your* answer.

DUSTKOPS are easier to install, save space, save money and are virtually trouble-free. Write for your copy of our free brochure to help you select the proper unit for your needs. No obligation, of course.

Also a complete line of mist collectors.

AGET MANUFACTURING COMPANY
1388 Church St., Adrian, Michigan

Circle 642 on postcard, page 33

MORE KVA PER POUND IN ACME ELECTRIC TRANSFORMERS —PLUS RELIABILITY

Lighter in weight, smaller in size, the new series Acme Electric transformers utilize a coil insulation film that far exceeds the 220°C requirement of Class H insulation. This means smaller, lighter, high performance coils. These new, high-temperature-resisting coils, plus grain oriented silicon steel, continuously wound cores reduce weight and size to a minimum and, as an added feature, the unique design of the induced air cooling system keeps heat from building up.

PRACTICAL FEATURES FOR EASY INSTALLATION

Mounting brackets are designed to permit easy hanging on wall or post with plenty of room to use tools. Dual knockouts lead into roomy, wiring compartment. Most popular ratings have solderless connectors mounted on connection panel, and are suitable for aluminum or copper low temperature building wire.

Quiet . . .

BEYOND BELIEF

If you need a quiet transformer, specify Acme Electric — where design and workmanship have been combined to provide performance you can't hear. Send for folder AC 100.

DAA3502/1960

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In Canada: Acme Electric Corp. Ltd., 50 Northline Rd., Toronto, Ont.

Acme ACME Electric

Circle 643 on postcard, page 33

DATA FILE

(Begins on page 212)

DUST CONTROL

Dust Control with Automation

Form FM60, 4 pp, describes features and advantages of automatic dust collector, with a cutaway view showing operation. Torit Mfg. Co.

For a copy, circle 403 on Post Card

For Dust Collection

Series 700 bulletins provide application suggestions and specifications on Dustkop equipment for a wide range of dust problems. Aget Mfg. Co.

For a copy, circle 404 on Post Card

MATERIALS HANDLING

Portable Conveyor Units

Operating principle of Airveyor transfer units is described in Bulletin A-20, with applications shown. Fuller Co.

For a copy, circle 405 on Post Card

Money Saving Conveyor Ideas

Brochure Conveyorama presents new ways to cut costs with conveyors, with demonstration photos of a low-accumulation-pressure live roller; clamp type carton stackers, high speed lifts. Standard Conveyor Co.

For a copy, circle 406 on Post Card

Metal Chip Handling Systems

How company's chip handling system separates trash, products, bar ends from wet chips; crushes chips, extracts and purifies oil; and loads out or stores the clean chips, is told in 12-pp Book 2926. Link-Belt Co.

For a copy, circle 407 on Post Card

Why Self-Dumping Hoppers

Cost-saving advantages of self-dumping steel hoppers for bulk handling are detailed in Bulletin 265. Roura Iron Works, Inc.

For a copy, circle 408 on Post Card

Truck and Tank Car Loading

Details on a spring balanced loading arm for petroleum and chemical service are presented in this 8-pp bulletin. Chiksan Co.

For a copy, circle 409 on Post Card

WATER, WASTE TREATING

Cooling System Treatment

Bulletin C1 describes advantages of company's treatment for cooling tower systems with synergized polyphosphates. Nalco Chemical Co.

For a copy, circle 410 on Post Card

For Corrosion Control

Pretreatment designed to promote rapid film formation as protection against cooling water corrosion is described in this data sheet. Advantages detailed. Betz Laboratories, Inc.

For a copy, circle 411 on Post Card

Continuous On-Stream Analysis

Details on the Chemonitor, for on-stream analysis of critical constituents in water, 16-pp brochure. Hagan Chemicals & Controls, Inc.

For a copy, circle 412 on Post Card

Compact Sewage Treatment Plants

Twelve-pp Bulletin 7330 covers design and operating features, installation of compact treatment plants for use where municipal sewage treatment is unavailable or pipe and pumpage costs prohibit tying-in to existing sewer system. Dorr-Oliver Inc.

For a copy, circle 413 on Post Card

OTHER EQUIPMENT

Keys to Steel Satisfaction

Design, steel selection and heat treatment are described as the keys to optimum economy and material performance in this 77-pp manual of basic information on increasing endurance limit of steels through this combination. Climax Molybdenum Co., Div., American Metal Climax, Inc.

For a copy, circle 414 on Post Card

Air and Hydraulic Equipment

Air control products for automating in-plant operations are featured in 48-pp digest-size Catalog 125, including cylinders, valves, rotating joints, filters, regulators, couplers and hose fittings. A. Schrader's Son, Div. Scovill Mfg. Co., Inc.

For a copy, circle 416 on Post Card

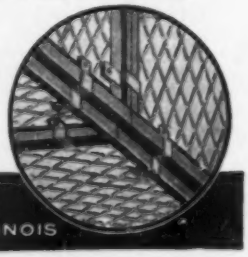
GLOBE SAFE•GARD EXPANDED METAL PARTITIONS with exclusive QUIK-ERECT patented fittings

(FORMERLY HILMAR)

...will answer all your enclosure problems

Here is the new, easier, simpler method of guarding conveyors and machines and for all in-plant partitioning. Shipped READY for erection, no cutting, drilling or welding required . . . these interchangeable expanded metal panels provide greater safety, cut overall costs, cover a wider range of use and require 85% less storage space.

EXCLUSIVE QUIK-ERECT SECTION CLIPS save much of the erection time formerly required. Proven successful in hundreds of installations, these Safe•Gard panels are of welded construction, give longer life, are more rigid and stronger than wire, will not ravel or fray.



Note enlarged detail showing SAFE•GARD Quik-Erect Clips securely joining the interchangeable panels.

Write today for more details or call your Globe (Grip-Strut) Distributor. Distributors in all principal cities, listed under "Grating" in your phone book.

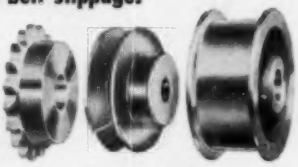
114

PRODUCTS DIVISION | THE GLOBE COMPANY
4016 SOUTH PRINCETON, CHICAGO 9, ILLINOIS

Circle 644 on postcard, page 33

360° TAKE UP FOR CHAIN AND BELT DRIVES

Controlled tensioning eliminates shock loading through excessive chain vibration, and horsepower loss through belt slippage.



- ROTATING ARM ACTION FOR GREATER ADJUSTMENT
- FULL 360° POSITIONING

A low cost tensioner for single and multiple width drives that is more adaptable to machine frames. *See your Power Transmission Distributor* or write . . .

BRONZED BUSHED IDLERS
18 SIZES
AVAILABLE FROM STOCK

BREWER MACHINE & GEAR CO.
1441 N. 2nd St. St. Louis 6, Mo.

Circle 645 on postcard, page 33

SMOOTH PERFORMANCE Superior UNDER TRYING CONDITIONS

STEEL DISC WHEELS WITH REPLACEABLE

POLYURETHANE TIRES

- Last up to 10 times longer.
- Resistant to oils, most detergents, acids and alkalis.
- Do not stain or mark asphalt or vinyl flooring.
- Shock-resistance protects loads.
- Clincher-type plates simplify tire changing.

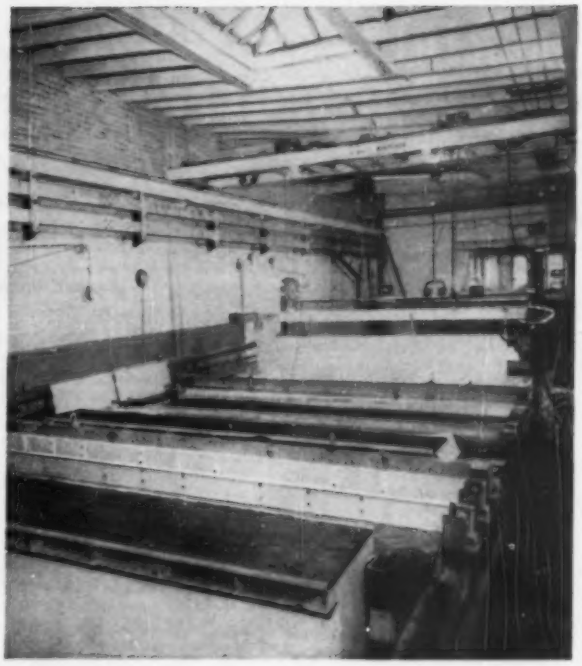
Sold by material handling distributors everywhere. Or write to address below.

Jarvis J&J Jarvis
AND

DIVISION OF UNITED SERVICE EQUIPMENT CO., INC.
Palmer, Massachusetts

In Canada: Jarvis & Jarvis of Canada, 1744 William St., Montreal, Que.

Circle 646 on postcard, page 33



FOR THIS BUS INSTALLATION

YOU COULD SAVE $673

BY CHOOSING

ALCOA ALUMINUM

The Alcoa® aluminum bus conductor used in this modernized Philadelphia plant* cost $673 less than copper bus with the same current-carrying capacity.

That's typical of the initial savings you can make with Alcoa aluminum bus.

But it's not all. You can handle aluminum easier, since it's only half as heavy as copper. You can cut and drill and bend aluminum bus easily. And aluminum will stand up well for many years under almost all conditions.

Before you make any decision on bus conductor, call your Rome Cable Division representative or refer to our Alcoa Aluminum Bus Conductor Handbook. In 270 pages it thoroughly covers the design and use of aluminum bus, in flat, round, tubular, channel, integral web, and sector bus shapes. Write to Rome Cable Division of Alcoa, Dept. 5-121, Rome, New York.

*Name furnished on request.

ALCOA
ROME CABLE
DIVISION

Circle 647 on postcard, page 33

DATA FILE

(Begins on page 212)

For Closed Circulating Systems

Described in this bulletin is Sun 21, heat-transfer oil for use in closed circulating systems with expansion tanks. High thermal efficiency and other advantages told. Sun Oil Co.

For a copy, circle 417 on Post Card

Self-Cleaning Magnetic Separators

Features and advantages of a unit that separates tramp iron from the burden by magnetic attraction are detailed in Bulletin 1206-B. Application data. Dings Magnetic Separator Co.

For a copy, circle 418 on Post Card

On Wire Cloth

Case histories of Inco nickel alloy applications in wire cloth, standard weaves, list of 150 chemicals filtered with it, mechanical properties, and physical constants are covered in this 16-pp bulletin. The International Nickel Co., Inc.

For a copy, circle 419 on Post Card

Hydraulic Press Brakes

Form 2024-D, 8 pp, describes hydraulic press brakes designed to perform a variety of operations with safety. Describes features, advantages and includes clearance dimensions and specifications. The Cleveland Crane & Engineering Co.

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Product Guide

Booklet 25B6057, 22 pp, shows the wide range of products manufactured by the company, with alphabetical listing and bibliography of literature available on these products. Allis-Chalmers Mfg. Co.

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Compressed Air Filter

Operating principles of a filter for removing dirt, oil and water are detailed on cutaway view in Catalog 6000. King Engineering Corp.

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Advantages of ADT central station protection service—holdup alarms, watchman supervision, burglar alarms, fire alarms, sprinkler supervision and waterflow alarms—are detailed in 40-pp Form 948-B. American District Telegraph Co.

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Fuel savings and increased performance made possible by using waste heat in the flue gases to preheat incoming combustion air are explained in 36-pp booklet. Air Preheater Corp.

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Stabilized Polypropylene Tubing

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Weighing, batching and proportioning systems for controlled weights and rates of material flow in industry are described in 48-pp Catalog 941. Includes data on constant weight feeders. The Jeffrey Mfg. Co.

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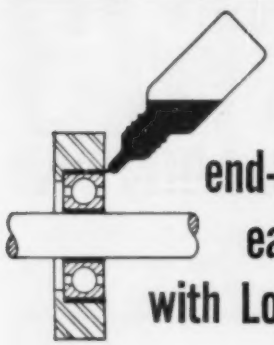

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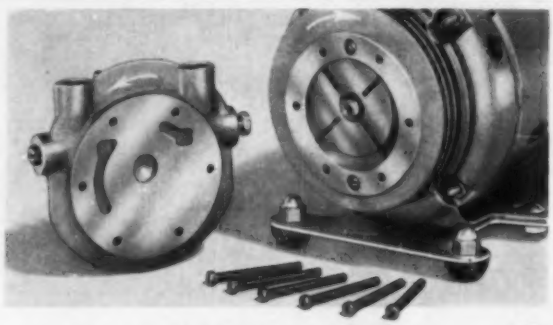

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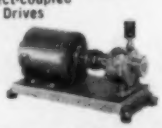

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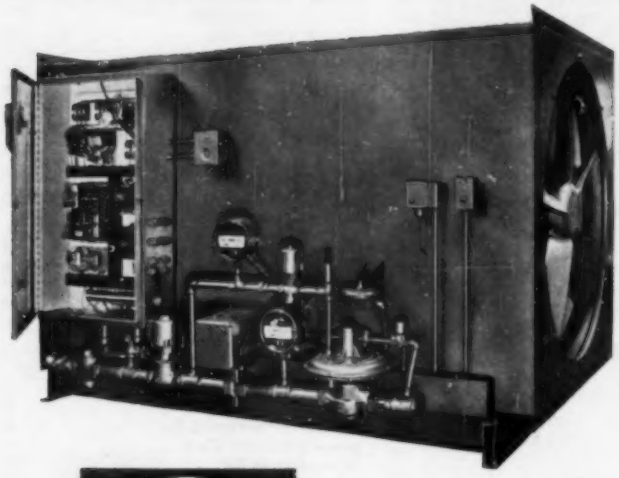

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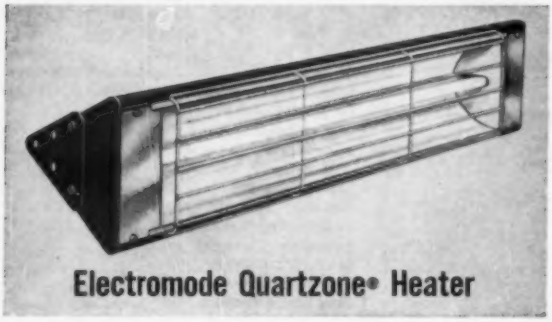

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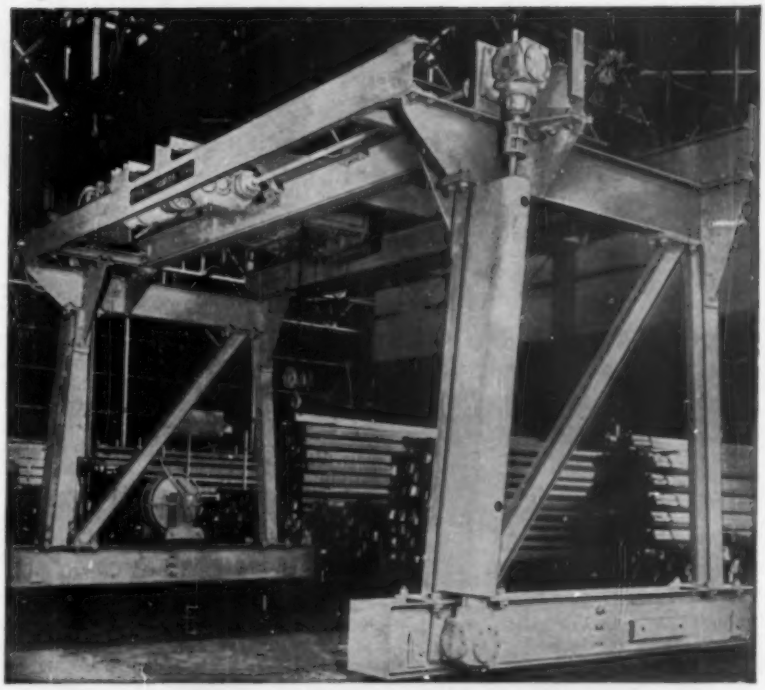

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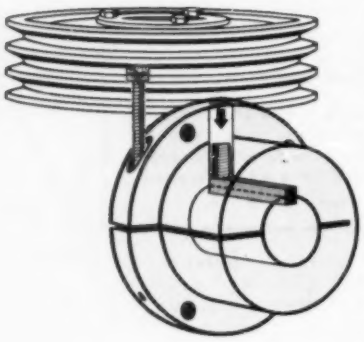
"AND THEN THE KEY CAME LOOSE..."



"Well, the key broke a window—it could have killed someone. A shaft was scored . . . the loss of drive power resulted in a loss of material . . . over $1,000 . . . we had to postpone deliveries 4 days." Frankly, this plant manager had it rough . . . though it could have been a lot worse, too. But he could have avoided the trouble completely by using Worthington sheaves that have the Two Golden Screws.

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Multi-V

Multi-Wedge

Positive Drive

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